PLASTICS & MOLDED PRODUCTS

Volume 7 JUNE 1931 Number 6

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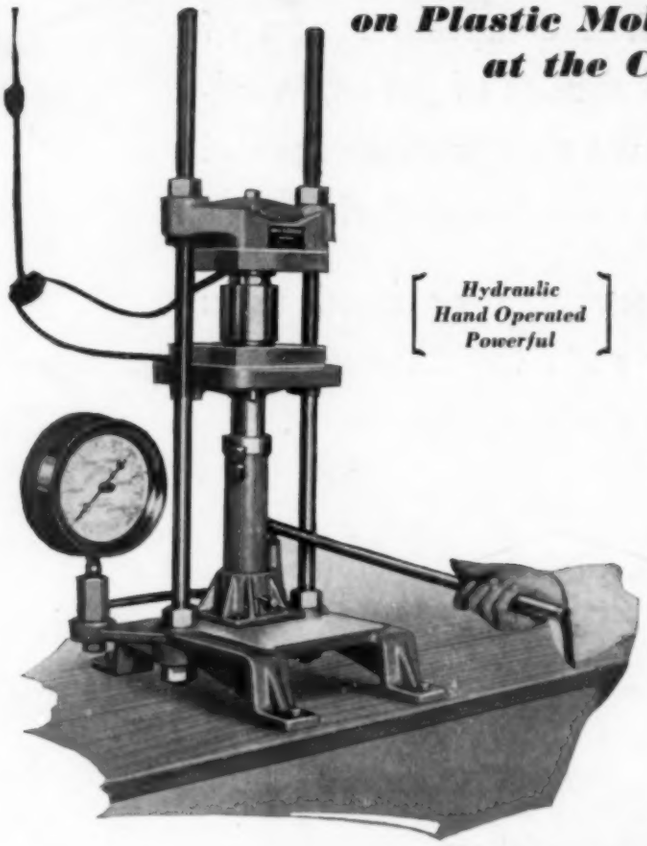

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PLASTICS & MOLDED PRODUCTS

Reg. U. S. Pat. Off.

Volume 7 **JUNE 1931** **Number 6**

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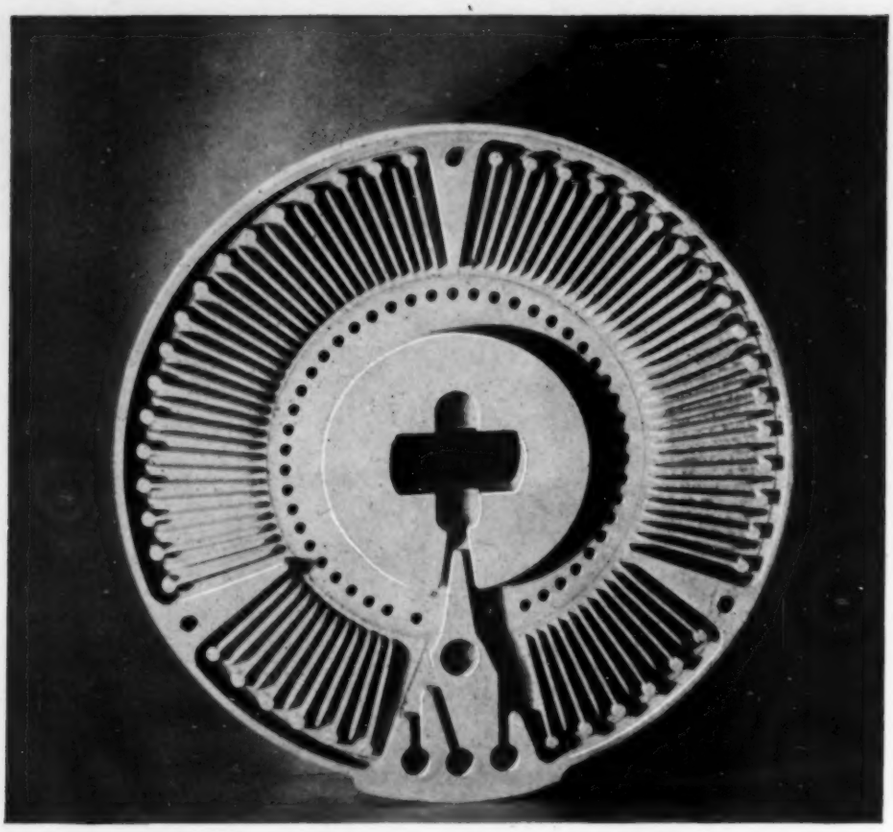

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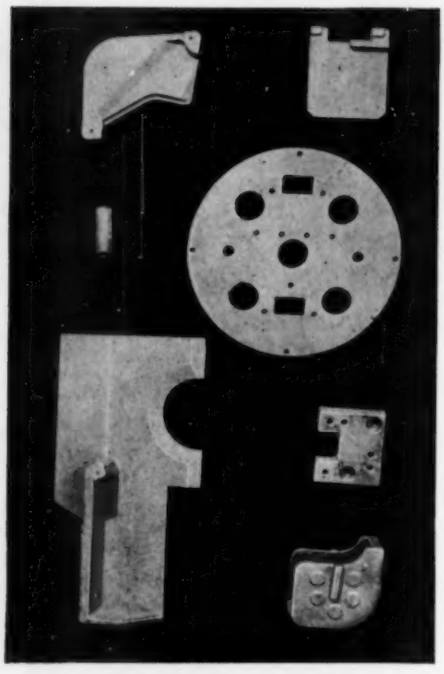

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PLASTICS & MOLDED PRODUCTS
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Volume 7 JUNE, 1931 Number 6

Plastics Conquer Old Man Par

By W. J. Curtis
Vice-President, Schavolite Golf Corp.

TECHNICAL research has at last invaded the final reaches of the long defiant realm of the golf profession. The standardization of golf equipment has come a long way from the day of the "gutty" ball and the "Cleek". After years of effort on the part of manufacturers of golf clubs, the steel shaft has been accepted as standard by the golfing fraternities of the world. And now one may look forward to a similar conflict between the old and the new in the composition golf club head which has just been developed in the laboratories of the General Electrical Company exclusively for the Schavolite Golf Corp.

On Shafts and Heads

In a recent advertisement appearing in one of the national publications, one of the foremost manufacturers of golf clubs in this country made a comparison between steel and hickory for use in golf club shafts, and in so doing went on to say that nature had seen to it that no two hickory shafts are alike and that the ever changing atmospheric conditions affected their flexibility, liveliness, and even their weight. As a result of years of study along this same line, some five years ago the Schavolite Golf Corp. was organized for the manufacture of a molded rubber composition head golf club, as it was realized that this same condition existed with heads as well as with shafts and that the golfer required precision tools in the game of golf the same as the master mechanic requires in his daily work. With this thought evermost in mind, the company endeavored to create a golf club that would not be changed by atmospheric conditions; would not absorb moisture; would not warp, chip, dent or break; a club that could be scientifically balanced at the time of manufacture.

After about three and one-half years in the golf field with the original molded rubber com-

It may not always be clear that the material used in a molded tube cap can be used to make a better chair seat. But everyone knows that sharp blows and damp weather are harmful to wooden golf clubs. The Schavolite Golf Club is an unusually interesting application of a synthetic resinoid molding material.

Uniformity in shape, weight and balance can be attained by molding—eliminating the human element in fabricating.

A Stillson wrench will not loosen the shaft when molded right into the head.

The molded heads come from the mold with a high polish. Note the contrast with a varnished wood club after short use.

position head club, the General Electric Company's officials, in charge of the Plastics Division, brought to the attention of the Schavolite Golf Corp., a plastic material from which they manufacture many products, including timing gears for automobiles, a material called Textolite.

After making very rigid tests on the material to determine whether or not it had the necessary qualifications from which to mold a golf club head, negotiations were entered into by the Schavolite Golf Corp. and the General Electric whereby the General Electric Company would mold golf club heads exclusively for Schavolite Golf Corp. As a result of these negotiations, the Company is now manufacturing a golf club equipped with a head molded of Textolite, which comprises all the foregoing qualities and in a price field to enable every "Tom, Dick and Harry" and every man, woman and child interested in the game of golf, to own a scientifically built set of golf clubs.

The product has many outstanding features. It will stand approximately five times the impact of the strongest wood and is many times as resilient. After exhaustive tests, both mechanical and human, it has positively been proven that the heads made of this material will drive a ball farther than heads made of wood, and the great thrill of any man's golf game is those long straight drives. No one appreciates this better than the middle aged golfer who finds old age creeping slowly upon him and the yardage in his drives diminishing as the years go on. The thought uppermost in his mind at all times is to put the old "pill" where he used to five, ten or fifteen years ago.

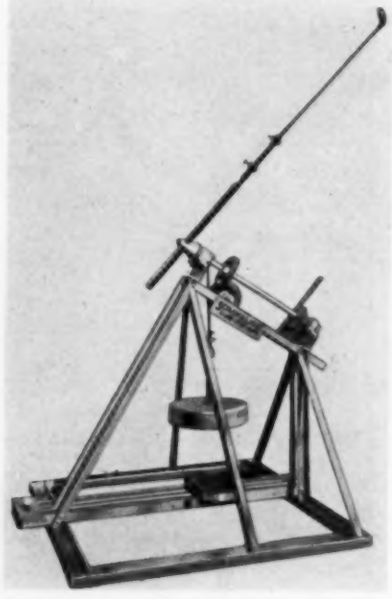
One of the outstanding features of this club is the fact that the steel shaft is molded into the head of the club, which virtually makes it a one piece construction, eliminating all vibration, and for the first time giving the golfer a steel shafted club with absolutely no vibration.

The shaft is molded into the club in such a way that it cannot turn or twist and cannot become loosened. A series of tests were made to determine the advantage of this method of shafting clubs, and it was found that in the ordinary type of wood club after a short series of shock impulse tests, the shaft could be loosened, whereas it was impossible to loosen the shaft in a Textolite head club in any way.

The molds from which these heads are made are chrominum plated. The heads come from the molds with a very high lucter finish, requiring no lacquers or varnishes, or after finishes, and giving a permanent surface, which is very hard to mar and will not deteriorate in appearance like the ordinary type of wood head club where lacquers and varnishes are used.

The club has been officially approved by the United States Golf Association for tournament play. We really believe that the advent of plastics into the construction of golf clubs has really created the dawn of a new day in the "royal and ancient" game of golf.

Impervious to moisture heat and cold, the molded fabric base material club head will even drive spikes without breaking.



The molded club will regularly drive 10 to 40 percent farther than wood in the driving machine, when operated by a 250 lb. weight.

No screws or rivets are necessary to hold the metal shaft within the head. It is permanently inserted during the molding operation.

Chemicals in the Synthetic Plastics Industry*

By Bradford S. Covell

Arthur D. Little, Inc.

BECAUSE of new chemical processes, cheaper products and increased demand, the plastics industry has grown from 1914 to over one-quarter billion in 1929 and today ranks as an important consumer of varied chemicals.

The types of chemicals required by this industry are varied and cover so wide a field that it has been thought best to discuss them in relation to the various groups of plastics in which they are used. On a basis of chemical derivation and in the order of their application and importance, synthetic plastics may be classed as follows: (1) The resins of coal tar origin, (2) the cellulose derivatives, and (3) resins of non-coal tar origin. Those materials may all be used in solvents as coatings or with inert fillers and pigments in molding compounds. This discussion will be confined to their applications in molding or pressing.

Phenol Requirements

The resins of coal tar origin —the phenol resins—are the best known and most widely used of the synthetic plastics. As raw materials for their manufacture, but two types of chemicals are required in large amounts. These are phenolic bodies such as phenol and the cresols and formaldehyde or its derivatives.

Phenol, more popularly known as carbolic acid, is derived either directly or indirectly from coal tar. The tar from coke ovens and gas plants contains a small proportion of phenol, some of which is extracted and purified for use. By far the largest amount of phenol is now made by one of two synthetic processes, both of which use benzene as the starting point. In the older of these two processes benzene is treated first with H_2SO_4 to give benzene sulfonic acid. This is followed by a caustic soda treatment and then carbonic acid gas to give phenol. The other and newer process employs chlorine gas to convert the benzene to monochlor benzene, which is hydrolyzed under pressure in the presence of a catalyst to give phenol. Benzene is one of many important products from coal tar distillation.

The phenol resins, more than any other group, have taken the lead in indicating the possible development of new and broader uses for plastics. In 1922 1,200,000 pounds of phenol were produced, while in 1929 this figure had grown to over 24 million, of which 73% was used in the manufacture of resins. The plastics industry has thus become the backbone of the phenol industry. Phenol is also used in the preparation of medicinals and pharmaceuticals as well as in dyes and dye-intermediates, and, in war time, in the manufacture of picric acid, an important military explosive.

As a substitute for phenol in the manufacture of these resins, cresylic acid is used as a cheapening agent, or when resins of special properties of flow or cure are required. Cresylic acid is made by refining the crude tar acid fractions from the distillation of coal-tar and is a mixture in which the proportions of the various cresols and xylenols may be varied, depending on the manufacturing procedure and on the source of the coal tar. In general, it may be said that cresylic acid for resin making should contain a minimum amount of the ortho-cresol, whose B. P. is 191° C, and a large proportion of the higher boiling constituents—meta and para cresol and the xylenols—whose boiling range is 202-225. The presence of ortho-cresol gives a very slow reacting resin when a cresylic acid containing an appreciable proportion of it is condensed with phenol.

Large amounts of cresylic acid for use in resin making come from England duty free, in 1929 about 18,000,000 pounds being imported. Other uses for cresylic acid are, in the preparation of tricresyl phosphate, a substitute for camphor as a plasticizer for cellulose plastic, and in germicides, antiseptics, and similar products.

Formaldehyde Consumption

With phenol and cresylic acid, formaldehyde and its derivatives are required in large amounts for the manufacture of these resins. Formaldehyde is commonly used as the 40% solution, but considerable amounts are also required of the formaldehyde derivatives, para-

*Presented at the Plastics Symposium, 13th Chemical Industries Exposition, under the auspices of PLASTICS & MOLDED PRODUCTS, May 6 and 7, 1931.

form and hexamethylenetetramine, commonly known as hexa. About 52,000,000 lbs. of the 40% formaldehyde solution were produced in this country in 1929, about twice as much as was required in 1924.

The 40% formaldehyde solution is made by the oxidation of methyl alcohol. Air and methyl alcohol vapor are passed over glowing copper spirals, when, by proper control of the process, a 40% solution of formaldehyde in water is obtained. From this 40% solution, the solid hexa is made by reacting formaldehyde with ammonia. Hexa is used in considerable amounts in resin making as it furnishes a convenient method of introducing formaldehyde and ammonia, as a solid, into a partially reacted phenol resin. Formaldehyde is also an important chemical in the third group of plastics which we will discuss later. Almost entirely because of the demands of the plastics industry, the production of hexa increased from 1,300,000 lbs. in 1927 to 2,400,000 lbs. in 1929. Other uses for formaldehyde and its derivatives are as a preservative and disinfectant.

In addition to phenolic compounds and formaldehyde, and of equal importance in the manufacture of these resins, alkaline catalysts, such as ammonia and caustic soda are required. These are, however, used in such small amounts as to be an almost negligible proportion of the total output of these chemicals.

Since 1920 the production of the phenol resins has increased from about 4,000,000 lbs. to 33,000,000 lbs. in 1929.

In considering the plastics of coal tar origin mention should be made of the latest addition to this group. This is the polymerized styrol resin. Ethyl benzene is the starting point for this resin, which was in a purely experimental stage until last year. Because of the abundance of the source of raw material and because of the very encouraging reports as to the properties of this resin, especially in the field of electrical insulation, it is an interesting addition to the plastics industry.

Cellulose Ester Plastics

Second in importance in the molding field to the coal tar plastics and requiring a far greater diversity of chemicals are the cellulose derivatives. The two esters of cellulose, the nitrate and acetate, and modifications of them, are, of course, available for a wide variety of uses. If considered in all of their applications, such as wrappings and coatings, as well as in molding, this group would outrank in volume and value all the other plastics. For uses other than molding a large number of various solvents and mixtures are required which are in themselves a very important group of chemical compounds.

The starting chemical for all applications of the cellulose derivatives is cellulose. This is a very common material occurring as the hard cell structure in all forms of plant life. Chemically it is a very complex compound whose true internal structure is not yet fully understood. The form in which cellulose is used varies widely in the different countries and in different locations in each country. Wood pulp, cotton waste from spinning mills, cotton linters, in fact, almost any form of natural cellulose may be used. The most commonly used form is cotton linters. Whatever the form, unless in an extremely pure condition, it must first be purified and then usually bleached. The purification consists in cooking under pressure in weak alkalies and beating or pulping under much the same conditions as exist in the manufacture of paper. This is followed by washing, and bleaching, usually with hyposulfite or hypochlorite. The cellulose is now in a fit condition for its conversion to the nitrate or acetate.

The plasticized cellulose nitrate or celluloid is the oldest of the cellulose group. Sulfuric and nitric acids are required in a large proportion to the amount of cellulose treated. After nitrating, the cellulose has changed but little in appearance but remarkably in properties, being now soluble in a wide range of volatile solvents. In order to make it plastic or moldable under heat and pressure, the cellulose nitrate is mixed with an alcohol or solvent solution of the plasticizer. Ordinary camphor is the oldest and most commonly used material for this purpose. Camphor may be obtained naturally by steam distilling the leaves and wood of the camphor tree. Considerable amounts are also manufactured from pinene, the principal constituent of turpentine. The camphor is thoroughly mixed and kneaded with the cellulose nitrate until the mass is in a homogeneous pasty form when it is rolled and formed under heat and pressure with subsequent cutting to sheets; or it is extruded to form rods or tubes, the excess solvent being removed by drying under moderate temperature—100 to 120° F.

In addition to the plasticizer, a stabilizer is required. This is a minor constituent of the mix whose important functions are to take up acids formed on the slow decomposition of the ester, to retard the rate of further decomposition, and to prevent discoloration. Urea is extensively used as a stabilizer alone or in a mixture with weak organic acids, such as lactic, boric and tartaric acids. Other stabilizers are NaOH, calcium oxide and zinc acetate. Aniline dyes, lakes and pigments are further required as coloring materials.

Non-inflammable, and of possibly far more potential importance in plastics is the acetate ester of cellulose. The same purified and bleached cel-

lulose is the starting chemical. In acetylizing, acetic anhydride, acetic acid and sulfuric acid are the chemicals required. Unlike the nitrate, the cellulose acetate is soluble in the esterifying agents and is precipitated therefrom by the addition of water. Like cellulose nitrate, the acetate must be plasticized before it is available as a plastic. For whatever purpose cellulose nitrate is employed, camphor is the ideal plasticizer. But this is by no means the case with the acetate derivative. For many years there has been an incessant search for a plasticizer which would be suitable for all applications of cellulose acetate. It is safe to say, however, that the perfect plasticizer for cellulose acetate has not yet been found. A plasticizer should be odorless, a fire retardant, stable to light and heat, substantially non-volatile, of high dispersion power in the ester gel, and a liquid or thermoplastic. Among the chemicals best suited are triphenyl and tricresyl phosphates. Other compounds used are dibutyl phthalate, ethyl and methyl phthalate, and various sulfonamides, or mixtures of these. The acetate is worked and processed into a plastic form in substantially the same manner as the nitrate, after various colors and pigments have been added to the mix.

Urea Resinoids

Since the successful commercialization of the resins of coal tar origin, several new compounds have been developed, primarily to obtain what the phenol resins did not supply, white and translucent colors. We thus come to our third group: the plastics of non-coal tar origin.

Developed originally abroad and recently offered in this country with considerable success, are the resins made from urea, thio-urea and formaldehyde. These chemicals in the presence of a dilute acid readily combine to give a colorless resin with thermo hardening properties which can be readily molded. Its main application has been in the non-shatterable tumblers, dishes and cups widely advertised and probably familiar to you all. Urea is now practically all made abroad but during the war was manufactured in this country, as well. It is made by either of two processes, one of which employs ammonia and CO_2 and the other calcium cyanamide and an acid. Many United States and foreign patents have been granted on most phases of the manufacture of urea. Most of the urea produced is used as a very high grade fertilizer, while the second important use is in plastics, for which it is predicted that 50,000 pounds will be required this year. Thio-urea, not a derivative of urea but very similar chemically, is also now made entirely abroad.

Glyptal Resinoids

The resins of phthalic anhydride and glycerine, the glyptal resins, have a very extensive use as coatings but a rather limited use in molding because of the high temperature and long period of time required for the conversion into their final form. Glycerine, a by-product of the soap industry, is used extensively in various forms of tobacco, in pharmaceuticals, in the explosive industry and as an antifreeze. Phthalic anhydride is made by the catalytic oxidation of napthalene and its most important use is as a raw material for dyes.

An old and well established group of plastics are those of casein and formaldehyde. The starting material, casein, exists in cows' milk in a suspended or collodial condition. After separating the cream at the dairy, the skimmed milk contains about 3% of casein, which is coagulated and removed, preferably by means of rennet. After cleaning and grinding, various dyes and pigments with water are incorporated in the casein and a semi-plastic mass is obtained. Rods, sheets and blocks are obtained by extrusion and pressing from which the finished articles are fashioned by further pressing or machining. By immersion in a weak formaldehyde solution the casein is hardened considerably and made more water resistant. The pieces are then finished by a slow, careful drying.

Vinyl Resins

Other members of this group of plastics which deserve more than passing notice are the new vinyl resins. These are now in about the same status as the styrol resins previously mentioned. Their raw materials are the readily available hydrocarbons ethylene and acetylene from which are obtained vinyl chloride and vinyl acetate. Under the influence of sunlight, or heat and pressure these compounds polymerize to give a resin which may be used in molding compounds or to give tough and flexible coatings. This completes our discussion of the chemicals required in the manufacture of the more important plastics. We have attempted to hit the high spots of the industry and have indicated one or two of the newer resins.

Future developments in plastics will of necessity be watched with interest by a major portion of the chemical industry.

Pyralin Coated Temples Used on Tortaline Eyeglasses

A RECENT development in the manufacture of metal framed eyeglasses is announced by the Tortaline Manufacturing Company in a new type temple known as "Temperl."

Temperl is a modern engraved metal temple embedded in pearl and covered with a thin transparent coating of a plastic composition which enhances the beauty of the engraved metal.

Laminated Plastic Materials*

By A. J. Briggs

General Electric Company

THE products dealt with in this talk may appear very diverse in kind and appearance; but they have one common denominator in that each is bonded with a synthetic resin, and given its final form by processing under a high degree of heat and pressure.

These materials are furnished in forms of sheets, rods, tubes and parts fabricated or machined from them. This latter group includes non-metallic gears which are machined from sheet material. Sometimes, where the demand for certain sizes is great, the gears are made from die-formed blanks.

Laminated materials are divided into two groups; the types made expressly for use as noiseless gears which are called "Gear Laminated", and others used for general insulation and mechanical purposes called, "Non-gear Laminated".

Non-gear Laminated users may be segregated into five classes: Radio, Automotive, Electrical, Decorative and miscellaneous.

Radio Applications

Radio manufacturers require minimum losses in current intensities; dealing as they do with very high frequencies, low voltages, and moderate amperages, the slightest loss affects reception. For this trade special grades have been perfected after the most exhaustive research, the most concentrated development, by the best minds in the laminated phenolic industry. This group of laminators have contributed substantially to the vast improvement of radio reception in recent years. Such radio parts as washers, bushings, tube socket bases, voice coil supports, terminal strips, condenser bars, transformer coil forms, condenser bases, are some of the many typical uses.

The automotive field is another which has benefited greatly by the progressive march of development in the Plastics industry on non-gear laminated. Special grades of fine weave, fabric base, materials have been perfected for brush holder insulation, terminal post insulators, switch terminal locators, etc. These grades were designed primarily for their mechanical strength but they also have unusual machining properties and insulating characteristics built into them. Large users in this field are the contributing manufacturers of such integral units as ignition and lighting systems, wind shield wipers, carburetors, fans and many other accessories for body and engine. The latest and perhaps one of the most unique uses in this field is the laminated phenolic running board which has been adopted as standard equipment by two of the better known automobile manufacturers.

Electrical Uses

Electrical manufacturers have always received most careful attention from laminators. Special grades have been designed for every type of insulation problem, but we continue to experiment on new products for this field. All manner of new component factors, such as special resins, papers, plasticizers, are constantly being tested and we strive continuously to improve the machinability, and the

Photo Courtesy Bakelite Corp.

The new offices of the Lamson Company are a distinct departure from convention in that they combine parts of their conveying equipment in the decorative scheme. The large center table has a resinoid laminated top in four sections, which may be rolled back to show rolls used in conveyor installations.

*Presented at the Plastics Symposium, 13th Chemical Industries Exposition, under the auspices of Plastics & Molded Products, May 6 and 7.

insulating properties of our product. Manufacturers of motors, control, signal apparatus, X-ray, line materials, transformers, and all sorts of electrical appliances, are substantial buyers of laminated insulation. Some of the many parts furnished to this trade are: bearings, bushings, bus bar protectors, panels, transformer tubes and an almost infinite variety of fabricated shapes for wiring devices.

For Decorative Uses

Laminated materials are successfully applied in the decorative field. They are now used extensively for table tops, window sills, store front bulkheads, counter tops, door panels, column covering, kitchen cabinet tops, sink drain boards, elevator and airplane cabin linings, and many other uses which are being discovered from day to day. These materials are unaffected by the weather, strong liquids, cigarettes, and practically all acids. They can be furnished in a variety of attractive finishes, such as mahogany, walnut, marble, modernistic effects, red, green, and many other pleasing designs.

Miscellaneous Uses

Next let us consider the miscellaneous classification. Laminated products have sometimes been described as "materials of a million uses". You will understand, therefore, that in a talk of this nature it is impossible to thoroughly discuss all uses or even most uses, but we can consider a few of the applications under the miscellaneous classification. I refer to these to indicate the unusual purposes for which these materials are employed, and to illustrate the adaptability of laminated products to all industries. Chemical companies use it for many purposes, because it is impervious to all ordinary acids; spinning buckets and covers, drip panels and boards, work tables, are some of the many uses in this field. Railways are giving laminated materials very careful consideration for use as track insulation because it is unaffected by weather conditions. Steel mills use it for roll neck bearings, because of its resilience. Central Stations use it for general insulation and switchboard panels. Outboard motor manufacturers for insulating parts and as shaft bearings because it is water resistant. Aircraft manufacturers use it for cabin linings, pulleys, guides and many other purposes, because of its light weight and durability. Manufacturers of office equipment use it for book binders because it is practically indestructible and for desk tops because of its beauty; and so it goes ad infinitum.

The desks and small tables in the Lamson office also have laminated tops. The top of the smoking table can be removed to display a recently developed spring-shaft roller. The floor lamps are working models of the company's standard spiral conveyors, one having a gravity roller, another a rod spiral, and a third a sheet metal spiral conveyor reaching from a large gear, forming the base, up to the light socket. Ash trays, humidors, and waste baskets are made from conveyor or pneumatic tube parts, combined with phenol resinoid.

Photo Courtesy Bakelite Corp.

Fabricating Shops

Fabricating shops and complete warehouse stocks of all grades and forms of non-gear laminated materials, are situated in all principal cities in the country in order to give adequate service and attention to all users in the foregoing classifications.

The greatest outlet for "Gear Laminated" is in die-formed blanks to the automotive industry; millions of laminated gears are installed annually as original equipment in the leading makes of automobiles. Laminated gears are quiet running, long wearing, shock resisting, and provide positive, permanent timing of the motor. They are also successfully employed on heavy duty industrial jobs, such as punch presses, milling machines, pumps, laundry machinery, textile machinery. For light-load, high-speed jobs they are equally successful and a special grade is furnished for these uses. Some of the installations of the light weight type are on calculating machines, coffee grinders, meat choppers, speedometers, high-speed hand drills and grinders, and many another machine of this nature.

Gear Stocks

Timing gears are available to the replacement trade through a vast chain of jobbers and dealers located in every city and village throughout the country to give thorough coverage and complete service. Industrial gear jobbers are located in every large city and have complete stocks of various thicknesses so that gears can be cut from them at short notice.

Plastics Progress in Pictures at the 13th Chemical Industries Exposition

Bakelite Corporation Exhibit introduced a new era in varnish making. The central panel displayed successive steps in the manufacture of the new synthetic resins. Applications of varnishes containing Bakelite synthetic resins were displayed, selected from the major industries—petroleum, railroad, marine, automotive, aviation, house, and product painting.

Celluloid Corporation exhibit stressed the growth in use of Lumarith molding material since the last exposition two years ago. Molded Tefra toothbrush handles, Durant and Willys-Overland automobile parts were shown. Other products displayed were H-Scale, synthetic pearl essence finish, and Lindol, flame retarding plasticizer.

Cellulose acetate wrapping and packaging material held the key position at the Eastman Kodak Company booth. Vacuum-packed walnuts and sardines in transparent containers were features. Powdered cellulose acetate and solutions in a wide range of viscosities were shown as stock products of the company.

Plastics and Molded Products booth again was clearing-house for information on this ever-increasing industry. What to use and where to get it was answered by the staff and the 3000 copies of the Plastics Primer which were taken by visitors in the course of the week.

Plastics Exhibitors Show New Developments in Materials and Applications

Thirteenth Chemical Exposition Draws 103,000 Visitors

THE consensus of opinion among plastics exhibitors at the Thirteenth Chemical Industries Exposition was that considerably more genuine interest was displayed by the 103,000 visitors than was the case at the last biennial show. Held again at the Grand Central Palace in New York City, the attendance was 25 percent greater than two years ago. The plastics industry was represented by more than a score exhibitors, including several new materials manufacturers. For the first time, custom molders, as such, exhibited.

New Bakelite Resins

The most startling disclosure in the field of synthetic resins was the display of the newly improved oil-reactive resins for varnish and enamel application. This material was made the principle feature in this year's Bakelite Corporation exhibit. Numerous comparative test panels were displayed to show the remarkable resistance of these finishes to sun, moisture and salt water. The oil-reactive resins enter into combination with linseed and chinawood oil to form a much tougher film than do the natural fossil resins or rosin ester gum formerly used to produce the best marine varnishes. That the new finishes are already finding many markets was indicated by the numerous, labeled containers of nationally known varnish manufacturers who use the new resins in their products. While oil-reactive resins predominated in the Bakelite exhibit, two display cases with many molded and laminated applications were included.

Celluloid Corporation placed especial emphasis on the development of Lumarith, the cellulose acetate molding material. At the last exposition two years ago, Lumarith made its first appearance, molded in tools that were in production with other materials. Several applications of Lumarith in actual production were shown, notably the refillable Tefra toothbrush handles, Durant Motors horn buttons, escutcheon plates and control handles molded in an oyster white mottle, and Willys-Overland gear shift lever knobs and control handles in onyx. Lumarith sheet stock was shown in several interesting applications, notably in the use of three dimension-effect display signs. H-Scale, the synthetic pearl-essence, was shown in combination with lacquers as a metal coating.

Durez Exhibit

General Plastics, Inc., manufacturers of Durez, displayed their product on the main floor of the exposition this year. Numerous molded applications were shown in a booth that brought much favorable comment for its pleasing design. Molded packaging, closures and cases of several kinds pointed to the expansion of this field in the past two years. General Plastics also featured their new oil-soluble resins, foundry core bonding material, abrasive wheel binders and impregnating materials for laminated stock.

The display of the Plastics Division of the General Electric Company was a pioneer effort in that it was the first time that a trade molding unit exhibited at the Chemical Exposition. The exhibit was made up of three sections, one featuring products molded from powder; another showing laminated gear blanks and fabric base molding; the third devoted to cold molded Cetec and refractory parts. The greater part of the display consisted of industrial applications intended mostly for electrical units. However the Schavolite golf clubs, described elsewhere in this issue, constantly drew the attention of crowds of visitors.

Molding Operation Shown

For the first time the visitor at the exposition had the opportunity to see a phenolic resinoid molding operation actually performed. Fred S. Carver, manufacturer of the Carver Laboratory Press, had one of the small presses in his exhibit fitted with electric hot plates in which an operator molded a small souvenir ash tray out of Bakelite and Durez. The Carver exhibit included presses with special fittings for other purposes such as pressure filtration and oil and fat extraction. Watson-Stillman Co. showed production size hydraulic presses for molding, as well as high-pressure accessories.

Baker Perkins Co., Inc., booth contained heavy mixing and kneading machinery used in the manufacture of all types of plastic materials. Some are jacketed for heating and cooling, several models being fitted with cored mixing blades for more accurately controlling reaction temperatures.

Arthur Colton Co., Detroit, Mich., manufacturers of pre-

forming presses and pharmaceutical machinery showed a wide variety of preforms made in their presses out of standard molding material. In an adjoining display were shown the molded parts made from these preforms. Preforms are used instead of the more tedious method of weighing each charge before it is placed in the press. F. J. Stokes Machine Co., Philadelphia, Pa., had one of their rotary preform presses set up in their booth. These presses are capable of making 250 to 300 pieces per minute up to 1" thick and have a die fill up to 2".

The Becker, Moore Co. exhibit showed the place of wood flour in the process industries. About 20 percent, of the wood flour produced is consumed in the plastics industries, other outlets being linoleum, explosives, ceramics and finishing materials. American British Chemical Supplies, Inc., showed their complete line of plasticizers and solvents for the plastics and lacquer industries; also the line of insecticides made by their affiliate, Kay-Fries Chemicals, Inc.

Phenolic Resinoid Solids

Phenolic resinoid solid plastics, in the form of sheets, rods and tubes, were shown by the Marblette Corporation and Crystillin Products Corporation. These materials, with their wide range of color effects simulating many natural stones, drew much attention. The exhibits included many finished and semi-finished articles such as lamps, clock cases, chess men and checkers, gavels, toilet seats and boudoir sets.

Stokes and Smith Company, manufacturers of Durite Plastics, showed many industrial applications of their molding material, as well as other forms of their phenol-furfural resinoid.

The exhibit of the Continental-Diamond Fibre Co., manufacturers of laminated phenolic products, contained several new developments. Chief of these was their Dilecto K-4 material which is highly resistant to alkalies, is odorless and does not attract odors, and also possesses high thermal insulating efficiency. This material, as well as the acid-resisting material, is made up in the form of piping and fittings with standard threads for use in the process industries where corrosion resistance is a first consideration. The exhibit included a pumping unit made entirely of laminated plastic parts, with the exception of screws, bolts, nuts and impeller shaft, and which had been continuously pumping a 32 percent solution of zinc chloride for over 12,000 hours.

Aside from photographic and fine organic chemicals, the greater part of the Eastman Kodak Company exhibit was devoted to cellulose acetate. A number of solutions, all having the same solid content, but with the widest range of viscosities were prepared and shown. These find many industrial uses, from the thin solutions for coating wires, to the viscous, dough-like masses used in making cellulose acetate plastics. Considerable interest was shown in the cellulose acetate wrapping

(*Continued on page 347*)

First Plastics Symposium Draws Audience From Many Industries

FULLY six hundred people crowded the two sessions of the first comprehensive symposium on the production and application of synthetic, plastic materials. Quickly planned to answer the current interest, this conference was made part of the program for the Thirteenth Chemical Industries Exposition held at Grand Central Palace, New York City, during the week of May 4-9. Given under the auspices of *Plastics & Molded Products*, with the cooperation of the Exposition management, eleven speakers, representing various phases of the industry, outlined the manner in which the plastics industry tied in with the manufacture of many products and pictured the bearing the industry's growth has had on the consumption of chemical raw materials. The same program was presented on two afternoons, May 6 and 7, and speakers and sponsors were most gratified by the interest indicated by actual workers in the field and also by those whose connection with the industry lies in either purchasing fabricated articles or furnishing raw materials. Mr. R. C. Gilmore, Jr., President of Plastics Publications, Inc., was chairman on both afternoons.

Speaking of the growth of the plastics industry as reflected in the demand for chemical raw materials, Mr. Bradford S. Covell of Arthur D. Little, Inc., said that from a total phenol production of 1,200,000 pounds in 1922, the requirements of the phenolic resinoid industry consumed 73% of the 24 million pounds produced in 1929. A similarly increased demand for formaldehyde had grown in that same period. Mr. Leon V. Quigley, Technical Editor of the Bakelite Corporation, speaking of the technical advantages and characteristics of the phenolic resinoids, said that these materials have attained their present widespread adoption because they are possessed of a remarkable assortment of properties and great ease of adaptability. The finished product is resistant to practically all of the normal conditions tending to structural breakdown, is characterized by a high degree of electrical and thermal insulation and requires practically no polishing after it is taken from the mold.

The subject of plastic materials derived from cellulose was covered by Mr. R. L. Simmonds

(*Continued on page 347*)

Molders, Fabricators and Laminators Show Products of Synthetic Plastic Materials

From pin dispensers to soda fountain seats were shown molded of Durez at the General Plastics, Inc. exhibit. New applications of Durez resinoid included a foundry sand core binder, pastel-colored molding material, and air-drying varnishes containing oil-soluble synthetic resin.

The Plastics Department of General Electric Company pioneered as molder exhibitor at the Chemical Exposition. Many industrial applications in Textolite and Cetec were shown. Schavolite Golf Clubs, heads molded of Textolite, created widespread interest.

The molding division of Moto Meter Gauge and Equipment Corp., was represented by one panel in the company's general exhibit. Molded parts for automobile accessories are their specialties.

Marblette Corporation showed beautiful phenolic resinoid solid stock and articles fabricated from sheets, rods and tubes. Simulating natural stones in many colors and mottled effects, toilet seats, lamps, clock cases, boudoir sets and chessmen were very attractive.

New laminated resinoid applications were shown at Continental-Diamond Fibre Company exhibit. Corrosion resisting pipes and molded fittings—both alkali and acid proof—created much interest with chemical engineers on process installations.

Molded Plastics

help modernize

Dental Operating Equipment

By Zaida A. Ellis

Bakelite Corporation

A genial pioneer in the dental profession once predicted that the art of dentistry was being made so attractive that some day people might choose to spend an afternoon in a dentist's office rather than attend a matinee. A twinkle in his eye belied his seriousness. Long years of alleviating dental misfortunes had left him with a full knowledge of the normal human dislike for pain.

No dental chair is so comfortably constructed that the occupant does not leave it with relief, and the electrically operated drill—reminding one of the drowsy hum of a bee on a warm summer's afternoon—has another similarity to that busy insect which causes the patient to eye it with apprehension. There is just one thing the average man wants to know when he enters his dentist's office, and that is, how soon he can get away.

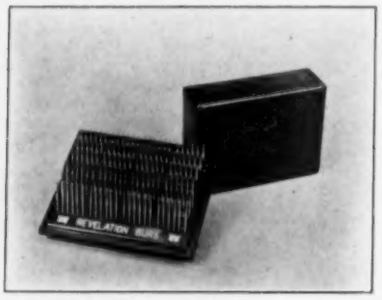
But how different the impression made by dental chairs, units, instruments, and other gadgets—not to overlook X-ray machines—when the role played is not that of a patient, but an observer. And when the visit to the dentist's operating room is not made under compulsion, but because of a natural curiosity concerning dental equipment and the material of which it is made.

The same chair now proves to be comfortable and inviting. Its smooth electrical operation is something to be admired. The shining steel low voltage instruments with the black Bakelite molded guards are rather fascinating. The Bakelite protected two-point electrode, or pulp tester, through which the current is applied to test the vitality of the teeth, inspires an impersonal interest in construction and material. The dental unit, only a name before, now becomes a vivid illustration of the powerful servant the dental profession has made of electricity. Here, is one convenient assembly, at the dentist's fingertips, are all the air, gas, water, and electrical essentials required in a day's diversified practice.

Psychology of color has also been considered in finishing the dental unit. Instead of the usual brown, black, or white, the dentist may now choose an ivory, gray, or green—cool, relaxing, soothing. The black rheostats, knobs, and dials of molded resinoids provide a theme of contrast against these pastel hues.

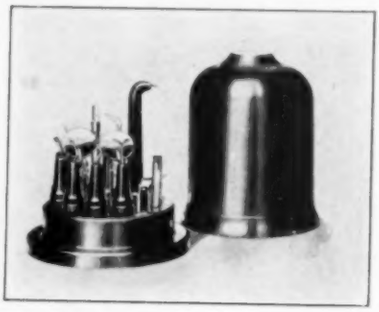
Colored enamel surfaces as a background for polished black resinoid and gleaming chrome steel instruments! What a contrast to dental equipment of only a few generations ago. No offices were necessary then. The itinerant dentist went to his patients, carrying his simple tools in saddle bags—if he were fortunate enough to possess a horse—or in pockets, or in a small hand kit, if he traveled afoot.

Modern dental science is of comparatively recent growth. The first dentists in the United States came from France and England during Revolutionary days. History records the practice of their profession among the soldiers of the Continental Army. That their methods could be improved upon is shown in the memoirs of Washington,



Courtesy of S. S. White Dental Mfg. Co.
Wood finishes were easily scratched; metal rusted; phenol resinoid material was the logical successor. ✦ ✦ ✦ ✦

Courtesy of Ritter Dental Mfg. Co.
The dental unit, in one convenient assembly, provides air-under-pressure, gas, water—numerous electrical essentials. Bakelite molded parts insure perfect operation. ✦ ✦



Courtesy of Ritter Dental Mfg. Co.
Standardizing on one material, phenol resinoid, for low voltage instrument guards, base, and cover. ✦ ✦ ✦

who complained sadly of the discomfort of his false teeth.

The founding of the Baltimore Dental College in 1840 marks the beginning, in the United States, of the study of dentistry as a science. Before, and for some little time after that date, apprenticeship was the popular method of learning the art of filling and extracting teeth. Sometimes, the formality of an apprenticeship was dispensed with. No state licenses were required, and one man who could relieve an aching tooth was as good as another.

The story is told of one dentist—a good dentist — who, stranded in a little town in Arkansas with one nickel in his pocket, turned his small capital into a complete dental outfit, and started in to practice his profession. A five-cent plug of chewing tobacco bought at the corner grocery furnished tin foil for fillings; some bits of iron and steel, discarded by the blacksmith, made his tools. As the dentist went from house to house, each kitchen became his operating room, a kitchen chair his dental chair, and—as he stood, with one foot on the floor and the other on the chair—his knee made a satisfactory head rest.

Sometime in the 1880's, the first electrically operated dental unit came into existence. It was crude, compared with the present units, as the early automobiles were crude compared with the beautiful motor cars of today. But it marked the beginning of a new era in dentistry. As the general use of electricity increased, the motors, wiring accessories, and insulating materials were improved, more use was made of electric power for dental equipment.

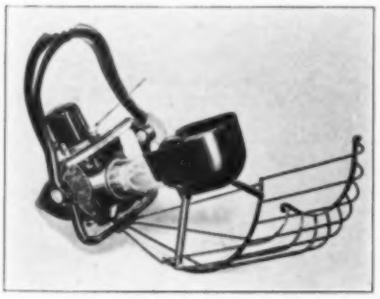
About 1910, a new insulating medium was found. Not only a new nonconductor of electricity, but a new kind of material, a product of the research laboratory—Bakelite phenol resinoids —announced to the world only the year before. These materials were highly dielectric, and had other properties which made them of value for dental equipment. They were hard, strong, and heat resistant, unimpaired by sterilization. From them, parts could be molded complete in one operation, no further finishing being required. And the smooth polished surface obtained in the steel molds was resistant to stain and wear.

From that time to the present day, the use of Bakelite molded resinoid in dental equipment has steadily increased. In many cases, the adoption of phenol resinoid has superseded an earlier use of other material. The dental spotlight, sterilizer, and bur block, are only three of the many examples of replacement of metal and wood by resinoids. For each replacement or new application, the reasons are the same—the practical appeal of superior insulation, durability, and ease of sterilization, the economic appeal of mass production, and the personal appeal of beauty of finish.

Some twenty parts of one modern dental unit are made of phenol resinoids. These include interior insulation and many exterior applications. Each application has been considered in terms of the patient's safety and comfort. Bakelite insulation guards against danger of electrical shock. Molded chair arms of the organic resinoid avoid the chill of metal. Molded head rests can be sterilized. Heat resistant guards on low voltage instruments carry an assurance that no hot metal will injure tender tissues. Regulated current can be applied in the two-point electrode pulp tester without disaster, for the metal contact points are imbedded in heat resistant, non-conducting phenol resinoid. And as a container for the low voltage instruments, an air-tight Bakelite molded base and cover provide efficient protection.

Another story could be told about the molded parts on the dental X-ray machine—the insulators which support the 45,000 volt, high-tension wire, the cup and clamp which are parts of the tube protector, the tube holders which support the lead glass shield, and the cone which

(Continued on page 355)



Courtesy of Ritter Dental Mfg. Co.

Phenol resinoids safely insulate the dental X-ray machine. Cup, clamp, tube holders, time switch and pointed cone are molded of this high dielectric material. Beauty, economy and safe insulation are combined in the one material. ✦ ✦ ✦ ✦ ✦ ✦ ✦ ✦ ✦ ✦ ✦

Technology of Cellulose Acetate

Progress in the Preparation of this Cellulose Ester as Shown in the World's Patent Literature during the last Decade.

By Dr. Aladin

Continuing this concise but comprehensive review of the world's patents on Cellulose Acetate which issued during the past decade, we now come to those patents which particularly relate to the

II. d. Pretreatment With Organic Acids

(Continued)

Serial No.	Patent No.	Patentee	Title	Brief of Description
58.	U. S. P. 1,722,914	H. Heimann and H. Bayerl (I. G. Farbenindustrie A.-G.	Preparation of cellulose esters.	The cellulose is treated prior to its esterification with formic acid. This accelerates the subsequent acetylation and affords a saving in acetic acid.
59.	Ger. P. 456,929	C. G. Schwalbe	Preparation of cellulose derivatives.	Cellulose is treated with dilute solutions of organic acids or their salts, so dilute that no hydrolysis will take place, even on subsequent drying. The acid is allowed to remain in the fiber and the latter is dried. The resulting product can be acetylated in half the usual time.
60.	B. P. 237,567	Societe chimique des Usines du Rhone	Pretreatment of cellulose for esterification.	See U. S. P. 1,543,310 (No. 49).
61.	B. P. 263,128	I. G. Farbenindustrie	Preparation of cellulose esters.	See U. S. P. 1,722,914 (No. 58).
62.	B. P. 263,938	H. Dreyfus	Preparation of cellulose derivatives.	See U. S. P. 1,711,111 (No. 57).
63.	B. P. 263,939	H. Dreyfus	Preparation of cellulose derivatives.	Cellulose which has been pretreated with acetic or formic acid is subjected to acetylation in the presence of not over six parts (as calculated on the cellulose) of glacial acetic acid containing 0.5 to 3% sulfuric acid. When adding non-solvents such as benzene, the fibrous structure will remain intact; but solvents such as ethylidene acetate or lactic acid may be used.
64.	B. P. 264,181	Societe Lyonnaise de Soie Artificielle (T. A. Chevalet)	Preparation of cellulose acetate.	See U. S. P. 1,671,513 (No. 53).
65.	B. P. 264,937	H. Dreyfus	Preparation of cellulose acetate.	Cellulose treated with acetic or formic acid is impregnated with a catalyst such as sulfuric acid and then acetylated with acetic anhydride vapors.
66.	B. P. 268,289	I. G. Farbenindustrie A.-G.	Preparation of cellulose esters. (addition to B. P. 263,128)	Cellulose such as cotton is treated before its acetylation, with 80% lactic acid at 80°C, pressed, washed, and dried.
67.	B. P. 282,788	Ruth-Aldo Co. (H. L. Barthelemy)	Manufacture of cellulose acetate.	See U. S. P. 1,668,484 (No. 50).

Serial No.		Patent No.	Patentee	Title	Brief of Description
68.	B. P.	287,540	Fabriek van Chemische Produkten	Preparation of artificial silk.	Relates to manufacture of cellulose acetate and the pretreatment of the cellulose with strong formic acid in presence of zinc chloride, surfuryl chloride, phosphorus oxychloride, and calcium chloride. The further treatment is with acetic anhydride in presence of hydrochloric acid or surfuric acid as catalysts.
69.	B. P.	288,657	British Celanese Ltd. (H. Dreyfus and C. J. Haney)	Preparation of cellulose esters.	See U. S. P. 1,697,907 (No. 56).
70.	B. P.	299,512	I. G. Farbenindustrie A.-G.	Pretreatment of cellulose.	See F. P. 639,119 (No. 78).
71.	B. P.	300,824	J. W. Bulmer	Preparation of cellulose acetate.	See U. S. P. 1,692,622 (No. 55).
72.	B. P.	305,601	I. G. Farbenindustrie	Preparation of celluiose esters.	Cotton or cellulose is treated with at least 80% formic acid, until about 4-10% of the same has combined with the cellulose. The product is then washed, dried and acetated.
73.	B. P.	308,322	H. Dreyfus	Preparation of cellulose esters.	Cellulose which has been pretreated with formic acid, acetic acid, etc., is acetated with acetic anhydrid together with from 5-20% (on the cellulose) of zinc chloride and hydrochloric acid.
74.	B. P.	312,095	H. Dreyfus	Manufacture of cellulose esters, artificial silk, film, and plastic.	Cellulose or hydrated cellulose such as viscose, etc., is subjected to a pretreatment with formic or acetic acid. It is then acetated with acetic anhydride (or esterified with other fatty acid anhydride) in presence of iron chloride or iron bromide in amounts of from 10-30% on the weight of the cellulose at temperatures of from below 0°C to not above 50° C. One may add solvents such as ethylidene diacetate or diluent non-solvents such as benzene. The products are acetone-soluble.
75.	F. P.	596,802	Societe Chimique des Usines du Rhone	Pretreatment of cellulose.	See U. S. P. 1,543,310 (No. 49).
76.	F. P.	621,376	Societe Lyonnaise de Soie Artificielle	Preparation of cellulose acetate.	The cellulose is treated with anhydrous (or 80-90%) formic acid for a few hours. The acid may contain a little sulfuric acid. The final acetation is effected as usual. This pretreatment prevents decomposition during the acetation.
77.	F. P.	638,897	Ruth-Aldo Co., Inc.	Preparation of cellulose acetate.	See U. S. P. 1,668,484 (No. 50).
78.	F. P.	639,119	I. G. Farbenindustrie A.-G.	Pretreatment of cellulose acetate.	A continuous web of cellulose is impregnated with acetic acid and then rolled up. It is subsequently run into the acetylating tank.
79.	F. P.	666,630	J. W. Bulmer	Preparation of cellulose acetate.	See U. S. P. 1,692,622 (No. 55).
80.	Swiss P.	115,706	Societe Chimique des Usines du Rhone	Pretreatment of cellulose.	See U. S. P. 1,543,310 (No. 49).

This review will continue in the July issue, taking up the subject of the pretreatment with various reagents.

NEWS *of the* INDUSTRY

Synthetic Plastics Co. Files Suit Against Aldur for Infringement

BILL of Complaint has been filed against the Aldur Corporation, of Brooklyn, New York, by Pollopas Limited and Synthetic Plastics Company, Inc., alleging that the former is infringing United States patents Nos.

1,458,543	1,625,283
1,460,606	1,687,312
1,507,624	1,762,456

relating to the manufacture and molding of synthetic resin of the urea formaldehyde type.

The patents cover inventions of Fritz Pollak and Kurt Ripper, of Vienna, assigned to Pollopas Limited, a British Corporation, and exclusive license rights for molding purposes have been granted to Synthetic Plastics Company, Inc.

The latter Company is a subsidiary of the American Cyanamid Company, and is engaged in the manufacture of Beetle molding powder and resins, which have been on the market for about two years,—one of their distinguishing characteristics being the fact that, unlike the familiar phenolic molding powders, the Beetle material is readily furnished in whites and all other light and bright colors.

Beetle has been finding a variety of industrial uses, such as clock cases and shatter-proof table-ware.

Richardson Has New Offices in New York City

THE Richardson Company, manufacturers of moulded composition products, has leased from Walter J. Salmon space on the twentieth floor of 500 Fifth Avenue and will take possession June 1. The company has its home office at Lockland, Ill., and plants at Melrose Park, Ill.

WHEN asked to comment on their position in the matter, the Aldur Corporation released the following statement:

"The Aldur Corporation wishes to assure the molding trade that it will defend the patent suit commenced against it by Synthetic Plastics Company, Inc., wherein it is alleged that the Aldur processes in some way infringe upon the "Pollak" United States Patent Numbers:

1,458,543	1,625,283
1,460,606	1,687,312
1,507,624	1,762,456

certain of the rights to which it is understood have recently been acquired by Synthetic Plastics Company, Inc., and that the production and sale of Aldur Molding Powder will be continued by the Aldur Corporation.

The Aldur Corporation has made a careful study of copies of the aforesaid patents and is unable to find any grounds for this suit, as it finds that the processes used in the manufacture of Aldur in no way infringe any of said patents, and this without going into the question of the validity of said patents, which, it is understood, has never been tested.

The management of Aldur Corporation believed that there was a necessity for a light colored molding powder which did not require the use of stainless steel or chromium-plated molds and could be sold at an attractive price. They, therefore, pioneered this field and Aldur was the result. Its ever-growing popularity (it has been the best selling Urea base molding powder of any kind in the field for more than a year) proves the soundness of this view.

Aldur is manufactured under special processes originated by it, which are distinct from any processes heretofore patented, and are fully covered by pending United States patent applications.

Any Aldur customers or prospective customers, who wish full protection in the use of Aldur, may obtain a written, unqualified guaranty from the Aldur Corporation, upon request."

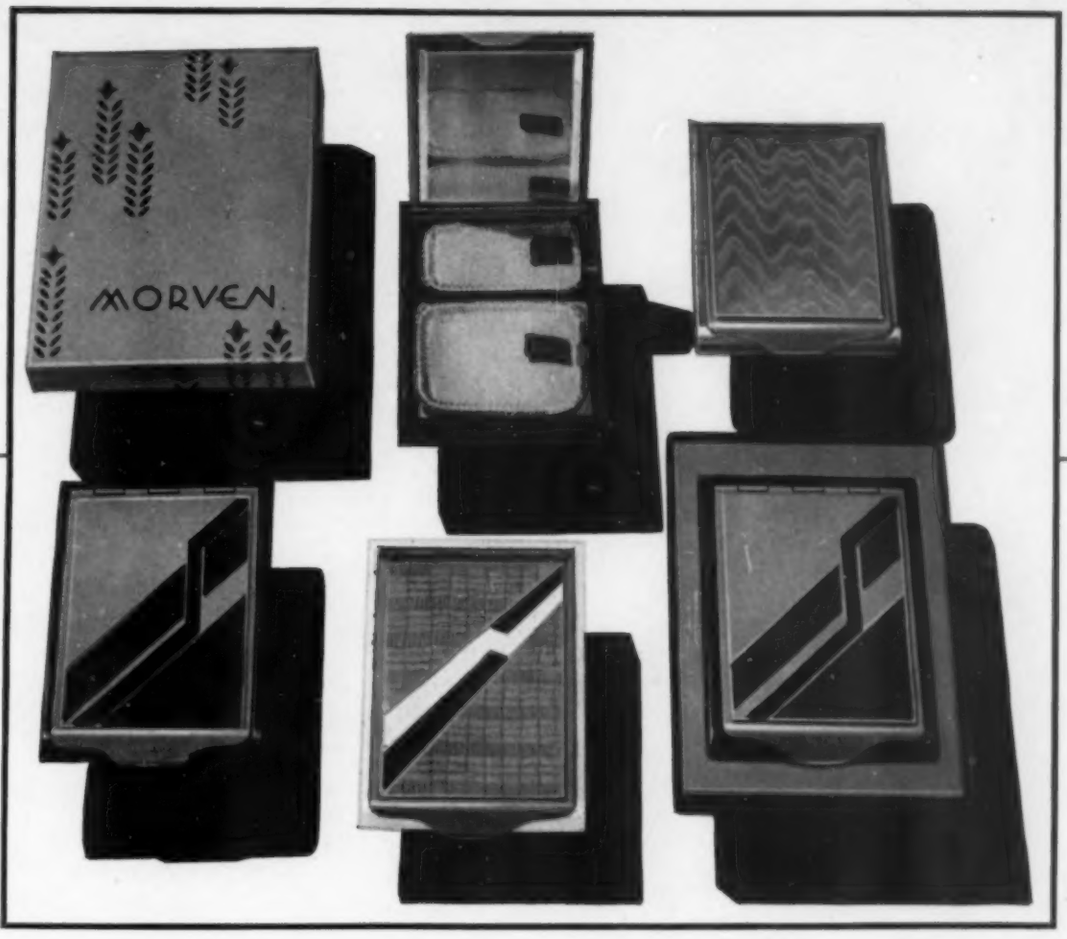
NEMA Accounting Manual On Sale to All Molders

A SUPPLEMENTARY manual of accounting procedure for the molded insulation industry is being prepared by the Molded Insulation Section of the National Electrical Manufacturers' Association, to augment the Association's more general uniform accounting manual for the electrical manufacturing industry.

Three parts of the supplementary manual have now been completed, namely, a classification of accounts, forms for financial statements and a section devoted to estimating procedure.

This supplementary manual is being developed by the accountants of the member companies of the Section in co-operation with the Association's Uniform Accounting Committee.

G. V. Sammet, President of the Northern Industrial Chemical Company, is Chairman of the Section's Cost Accounting Committee, and the chairmen of the four subcommittees that developed the technical material are—Jos. N. Brown (Kurz-Kasch Company), W. S. Grove (American Insulator Corporation), E. P. Herrick (Colt's Patent Fire Arms Company) and W. J. Patterson (Westinghouse Elec. & Mfg. Company).



Powder in "Beetle" Molded Compacts Makes Excellent Sales Ammunition . . .

A notable example of the way odorless, tasteless, non-absorbent "Beetle" moldings aid sales and build resales is its use for compacts. Priced in the popular price range, these colorful, light, strong and sanitary compacts instantly appeal to discriminating women.

Not only for compacts but for thousands of other articles as well, "Beetle" Molding Powder provides the means of increasing sales of molded products. "Beetle" moldings are non-inflammable. They are practically unbreakable. They are dielectric. Standard molding practice produces moldings of satin-smooth surfaces. There is a choice of ten gorgeous colors including several delicate pastel shades. The colors and the finish are permanent.

Whatever your particular molding sales problems may be, we will be glad to discuss them with you. We can refer you to leading molders who are licensed and equipped to produce "Beetle" moldings of a wide variety. Write for complete information.

CYANAMID PRODUCT

"Beetle"

SYNTHETIC PLASTICS COMPANY, INC.

A Division of the AMERICAN CYANAMID COMPANY

535 FIFTH AVENUE NEW YORK

The supplementary manual is in loose leaf form and new sections as issued are sent to subscribing members. The manual is also available to non-member companies in the molded insulation industry. It is sold to such non-member companies together with the manual of the industry for $15.

Bakelite Notes

BAKELITE Corporation was represented at the Annual meeting of the American Institute of Chemists, held in Washington, May ninth, by L. V. Redman, president-elect of the American Chemical Society, and Leon V. Quigley, chairman of the Committee on Membership of the A. I. C. At this meeting, the 1931 Institute Medal was presented to Secretary of the Treasury Mellon and his brother, Richard B. Mellon, "for their noteworthy and outstanding service to the science of chemistry and the profession of chemists in America." Dr. Redman, as president-elect of the A. C. S., addressed the medallists on the subject of "A Message of Appreciation from the Chemical Profession."

ON May 20th, Mr. Allan Brown, advertising manager of the Bakelite Corporation, spoke at a meeting of The Industrial Executives of New York, at the Pennsylvania Hotel. His topic was "Industrial Advertising and Sales Promotion."

LEON V. QUIGLEY, Technical Editor of Bakelite Corporation, gave the following lectures before audiences in St. Louis and Cleveland during the week of May 10th:

May 12th — Luncheon — St. Louis Electrical Board of Trade. "Bakelite Materials in the Electrical Engineering Industry."

Evening — Meeting of St. Louis Industrial Electrical Engineers. "Invention and Industrial Development of Bakelite Materials."

May 14th—Case School of Applied Science, Cleveland. "Replacing Metals by Synthetic Resins."

New Publications

F. J. Stokes Machine Catalog

F. J. STOKES MACHINE CO., Philadelphia, Pa., have ready for distribution their new catalog No. 31 devoted to process equipment. Of especial interest to plastics manufacturers and molders is the description of and data on drying equipment, solvent recovery systems, impregnating apparatus and preforming presses.

Mikro-Pulverizer Booklet

PULVERIZING MACHINERY COMPANY, New York City, have released a new booklet describing their Mikro-Pulverizer grinding equipment. Dustlessness, accessibility and the elimination of two-stage operation are features said to distinguish the machine.

Abbe Sifter

ABBE ENGINEERING CO., INC., New York City, have prepared a pamphlet describing their new high-speed turbine sifter which is constructed on entirely new principles. Its increased production and efficiency, even feed and delivery and small space requirements are said to be decided advantages over older-type installations.

Progress of Plastics in Great Britain

By L. M. T. Bell

Borough Polytechnic Institute, London

THE Molding Industry in England continues to make good progress. There is a decided tendency on the part of the general public to favor molded articles to replace polished metal and wood, the appearance and durability being much improved and the cleaning simplified.

Molded plastic domestic ware is in great demand when executed in some of the brighter colored thermo-setting compounds and the whole trade is keenly watching this market at the present time. Following a lead from the continent, larger parts are being made and many wireless firms are listing sets complete in molded cases. Bakelite or some similar material is the compound used.

The ebonite section of the plastics industry is at present busy developing their 'dust' process in an attempt to recapture some of the market lost through the use of Bakelite, etc. On the other hand one large ebonite dust manufacturing firm has commenced the production of a Bakelite substitute and thereby signified its belief in the future of the synthetic product.

Molding by the injection process is on the increase and is rapidly widening the molders' markets. Cellulose Acetate is the favored material but some attention is being devoted to the use of Bakelite and Urea compounds in this manner. Lack of technical knowledge in the various works is very regretable, few molders can give any intelligent information regarding the properties of their molding mixtures, nor are they equipped for even rough and ready routine testing of their products. The only systematic specifications at all relevant are those recommended by the British Electrical and Allied Research Association for the use of molded compounds in that Industry.

The trade paper, 'British Plastics' is now an established success and is doing excellent work for the general good. In addition, there has been formed recently a Plastics Trade Association for the protection of the molder's ever growing interests. A Plastics Club is being formed to promote intercourse and by encouraging interchange of views and experiences to increase the amount of technical knowledge available.

The classes held at the Borough Polytechnic have been so

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successful that the authorities have decided to continue them and also to enlarge the scope of the work, the laboratories are also being enlarged for the complete manufacture and testing of all types of compounds. The trades are beginning to use the laboratories to obtain reliable data.

Notwithstanding the general progress, prices are very keen and considerable dissatisfaction is expressed by the old established molders on this account. It is, however, caused by the new molders who have installed modern plants and by efficient methods reduced their costs. The older molders are now faced with this competition.

On the Continent

Progress has been even more rapid than in England due to the bigger home market. Germany is producing big moldings in Bakelite compounds and molded furniture is well in sight.

France has produced some interesting materials among which may be mentioned a molding casein and synthetic compounds of the Bakelite and Urea classes for injection work; all of which are well beyond the experimental stage. There is no doubt that the expiration of a number of material patents recently has done much to encourage research with very excellent results.

Recent British Trade Developments

THE business of Rissik, Fraser & Co., Ltd., Croydon, has been sold, together with the plant and equipment, and under the name of Croydon Mouldrite, Ltd., a private company has been registered with a capital of £21,000 ($105,000) in 20,000 7½ per cent cumulative participating preference shares of £1 and 20,000 ordinary shares of 1s. each to carry on the business of manufacturing and dealing in vulcanite, ebonite dust, synthetic resins and similar products. As the services of the technical and sales staff have been retained, continuity is assured in the

quality of the molding powders produced. Large additions are said to be made to the Croydon plant to cope with the increasing demand for the firm's goods.

MANUFACTURERS and shippers are advised that articles bearing British registered trade-marks or designs should not be sent to the Irish Free State unless the trade-mark or design is also registered there. The penalty is $25, and the Comptroller has issued a warning before taking steps to stop infringement of the Irish Act.

OVER 100 people connected with the plastics trade attended a recent meeting in London to consider the formation of a Plastics Club. It was apparent from the views expressed that the industry desires to have some organization that will cater for the needs of the industry in arranging for practical discussions to take place and for a wider knowledge of the trade as a whole. Papers and lectures by practical men are desired. The view of one man was that there should be more co-operation with the Institute of the Rubber Industry and that, as rubber is a plastic, any club should include that trade in its scope. It was finally decided that the word "Institute" was more appropriate than "Club," and a committee of seven was appointed to go thoroughly into the question and report later.

THE new molding powders of the Imperial Chemical Industries combine are available in black and brown and will shortly be marketed in a range of bright colors which can be molded at temperatures of 200 deg. F. to 370 deg. F., producing moldings which are fast to light and acid. Uniformity, good flow, high polish, easy ejection from mold, high electrical properties, wide range of molding conditions, and small shrinkage are among the qualities claimed for these powders.

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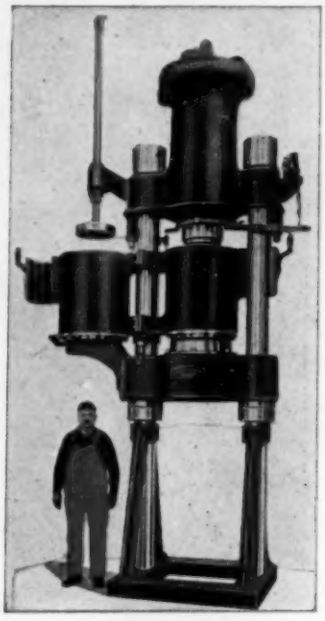

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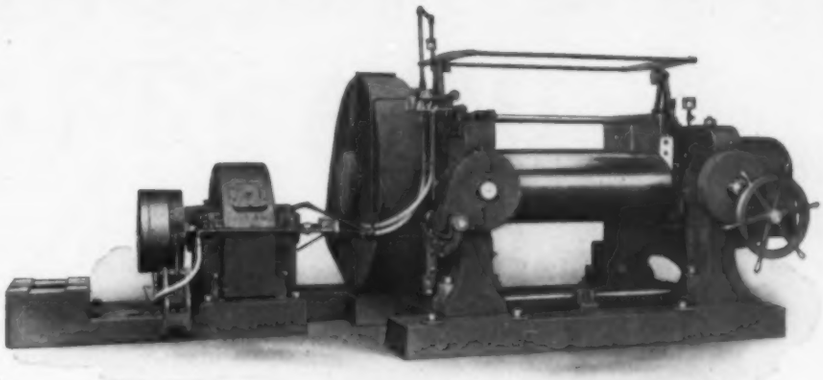

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Cotton or Wood Cellulose—Which?

A Production Problem in the Manufacture of Cellulose Esters suitable for Plastics

By C. Stark

Consulting Engineer—Berlin, Germany

The author goes exhaustively into the matter of the choice of raw material for producing cellulose nitrate. The present portion of his article deals particularly with cotton.

IT is a well known fact, that although, generally speaking "cellulose is cellulose", yet there is a very great difference between the various types, such as between that derived from cotton and that which is made from wood, as sulfite fiber and the like. The final products obtained when using different kinds of cellulose also differ very considerably. It appears that during the working up of the cellulose, as well as during the nitration and stabilization, there is a shift in the molecular aggregation of the cellulose, which diminishes the size of the cellulose molecules, whereby differences in the chemical nature and behavior of the final product are brought about. These chemical properties in turn also determine the usefulness of the finished products made therefrom. It is hence quite a logical deduction that the choice of the proper raw material for the manufacture of the cellulose nitrate (pyroxylin) (collodion cotton) (soluble cotton etc.) is important, as it will affect the products such as plastics, lacquers etc. that are manufactured from it.

Twenty Years Experience

The experiences collected during the last twenty years, and particularly those of the decade just ending, have thrown much valuable light on this important subject.

The raw cotton as delivered by the cotton growers is quite impure, being mixed with foreign substances such as seed, dust, sand, leaves, sweat, oil and other impurities. The picking, transportation, baling, shipping and storage of raw cotton is carried out under conditions which make the presence of these impurities unavoidable. Besides this, raw cotton contains various non-cellulosic constituents such as gums, fats, waxy and resinous substances, tannins, coloring matter and pectic acid, all of which would act detrimentally on any cellulose esters made therefrom. It is hence of the utmost importance to remove these foreign substances before employing the cellulose for the manufacture of pyroxylin and the like. To effect this result, the cellulose is subjected to an intensive cleansing and purifying process, to which there is usually also coupled a bleaching operation. Previous to any chemical treatment, the cotton should have been, or be, sorted into grades, such as are predicated upon its origin, color and appearance, as the cleansing and purifying treatments differ for the different grades of cotton used.

In general, the first operation consists in tearing the cotton so as to open it up as far as possible. It then passes through a purifying machine in which the seeds, woody particles, sand, dust, leaves etc. are mechanically removed. This is followed by careful washing, boiling, lixiviating for the removal of soluble impurities and bleaching of the cotton. In order to remove the inpurities which interfere with the proper nitration of the cotton, it is subjected to very thorough boiling and washing processes, which usually employ dilute sodium hydroxide or potassium hydroxide solutions, although the latter is now rarely used because of its cost. The concentration of the alkaline solutions used must be very carefully controlled as it exerts a most marked effect on the cellulose. Cotton intended for the manufacture of pyroxylin plastics is usually cleaned with a sodium hydroxide solution that does not exceed 10° Be. in strength, because *if the solution is stronger than this, a more or less intense mercerization of the cotton is effected, and this will lead to the production of a cellulose nitrate of very low viscosity, even though the nitration is the standard one for producing plastics-pyroxylin.* It will thus be seen that even so early in the process care must be taken to observe certain conditions, even to the extent of properly adjusting the strength of the lye in which the cotton is treated. A further effect of the use of strong alkalies during this stage of operations is the loss in fiber.

Cotton Fiber

The individual fibers of cotton consist of an elongated cell, the ends of which are conically tapered. On drying this shrinks and thus forms an irregular sort of ribbon with thick edges. The cell consists of a cell-wall and a central canal called lumen, which is filled with air. The walls of the cell in turn are coated with a thin membrane termed the cuticula. The actual thickness of the cell-wall of the cotton cell is about from 1/3 to

2/3 of the total diameter of the cell. The boiling operation is for the purpose of softening the cotton cells so that the alkali may act energetically upon the cell wall. This boiling takes place under a pressure of from two to three atmospheres, and the diluted alkaline solution is constantly circulated. The fatty substances present in the cotton are thus removed, whereby some of the alkali is used up. It then becomes of importance to determine the amount of fat in the cotton, and to adjust the strength of the alkali solution to compensate therefore, as it is most desirable to maintain a definite excess strength of caustic during the boiling, so as to prevent too great degradation or depolymerization of the cotton cellulose during this phase of treatment. It is most important to maintain the cellulose as nearly in its original pure condition as possible. After the treatment with the alkali, the cotton cellulose is thoroughly and repeatedly washed with hot water.

Purifying Methods

The treatment is directed to the removal of the pectinic bodies, tannins, fats and resins, as far as possible. It is advisable to carry out these operations in the absence of atmospheric oxygen, in order to avoid oxidation of the cellulose. The caustic alkali used for this boiling operation should be free from iron chloride, sodium chloride etc., and the water employed should not be hard. The softer the water, the more active will be the caustic alkali solution, and hence the more rapid the cleansing operation.

After the alkali has been washed out of the cotton after the alkali boiling operation, the cotton is bleached in special bleaching-vats, wherein it is subjected to the action of a dilute solution of calcium hypochlorite or alkali hypochlorite, whereby the coloring matter present in the cotton is destroyed. It is important to use the bleach in a sufficiently dilute condition to prevent an attack upon the fiber itself, for this would lead to the formation of oxycellulose, $C_6H_{10}O_5+C_6H_{10}O_6$.

During the further treatment of the cellulose there is occasion for the use of dilute sulfuric acid, which yields hydrocellulose: $(xC_6H_{10}O_5)n.H_2O$. This use of acid is however unavoidable, and is carried out at the boiling point temperature in order to remove all traces of the chloride of lime or other hypochlorite that has been used for bleaching. The solution employed contains about 0.3 to 0.5% of sulfuric acid and an antichlor. *Cotton which contains too much oxycellulose (from too strong bleaching) and hydrocellulose (from too strong acid) will yield, on nitration, low-viscosity collodion cotton (pyroxylin).*

Further Operations

Following the bleaching and treatment with the sulfuric acid and the antichlor, the cotton is repeatedly washed with water in special vats, whereupon it is dried. The drying takes place by first squeezing out the excess water, opening up the compacted cotton thus produced, followed by final drying; after which the product is baled.

Another form of specially prepared cellulose suitable for esterification is paper made from cotton fibers. This is made by taking the purified cotton, made as hereinabove described, and beating the same in a paper hollander, and then forming the same into sheets of paper on a standard type of paper machine. For smaller factories that nitrate their own cellulose, such cotton paper is much to be preferred, as it obviates all necessity for the rather space-consuming cotton-purifying apparatus. The paper is furnished in rolls, and is dried before nitration at a temperature of from 30 to 40° C., so that it will contain about 1% of moisture. It is then run directly into nitrating pots or specially constructed nitrating apparatus. The specifications for a good nitrating paper are:—

brilliant clean white color, entire freedom from lumps free from fillers and sizes, weight per square meter from 14 to 22 grams, readily soluble, and absorptive of the nitrating acid.

Such specially made nitrating cotton-paper is used for higher grades of pyroxylin plastics, especially for transparent film, imitation bone and ivory etc. As compared with cotton fiber itself, cotton paper will yield a pyroxylin that is somewhat lower in viscosity than that from the cotton itself; so that the plastics made from the same (i.e. from the pyroxylin derived therefrom) will be somewhat harder and not quite so elastic as that from cotton pyroxylin. This is due to the fact that in the making of the cotton paper the cotton is subjected to more working and slightly stronger alkali solutions.

For especially high grades of cellulose nitrate, in which case price is a minor consideration, and where the main desideratum is light color, high solubility but high viscosity, cotton thread is used; although this is only for exceptionally fine goods. This yarn has good wettability and yields a very transparent final product. It is used mainly for making highly transparent celluloid, for white ivory imitations and for photographic collodion.

Specifications

The cotton itself, to be suitable for nitration, must possess the following properties:

1. absolutely clean, no impurities such as sand, dust, seed, paper etc.;
2. light brilliant white color
3. very loose, and free from knots, bunches, hard-pressed parts, etc.
4. as long individual fibers as possible.
5. Moisture below 1%
6. Fat content not above 0.2%
7. Ash not over 0.3%
8. wood-gum content not over 1%
9. Chlorine, not more than traces.

(*Continued on page 354*)

Ornamental Effects With Plastics

An exhaustive study of the patent literature on this important matter

By Charles W. Rivise

LACK of space in our May issue prevented the completion of this article (see also March 1931 issue) on p. 287 of the May issue some of the later printed ahead of the present part, which deals with the foreign patents in this art. British 23,789, 1906 albuminous matter is treated with sodium chloride and electrolyzed by means of metallic electrodes to produce a material suitable as a substitute for celluloid, horn, shell and ivory.

British, 636/ 1910.

A horn substitute is produced by condensing a drying oil as China wood oil or fatty acids or derivatives thereof with amido-derivatives of hydrocarbons as amines or diamines in presence of zinc chloride or aluminum chloride with or without water. Asphalt, pitch, resin wax, oil, artificial rubber, cellulose, glue, albumen, casein, gums, algin, etc. may be added.

British, 28,155/ 1910.

Fibrous material preferably in pulp form is mixed in the presence of water with the reagents for forming a phenol-formaldehyde condensation product and the reaction carried to completion. Product is mixed with sizing, thickening agents, starch, initial or final phenol resinoid, China clay, soap stone, mica, or albumina and made into articles such as buttons or knife handles having marbled, tortoise shell or mottled effects.

British, 28,453/ 1913.

A tortoise shell substitute is produced by rendering gelatin obtained from fish bones insoluble with formaldehyde or tannic acid and mixing with transparent or suitably colored gelatin.

British, 16,070/ 1914.

An artificial mother of pearl is made as follows:

Pellicles or layers of muscovite and gelatin are superposed alternately and compressed while being heated and then immersed in formaldehyde. The muscovite may have been immersed in titanium chloride solution and heated and the gelatin may have been coated with fish scales or scales of pholerite or nacrite.

British, 106,448.

A substitute for horn, ivory, amber, tortoise shell, etc. which may be used for fancy turnery is made by treating melted gelatines with decoction of hops and dicarboxylic acid such as oxalic acid, drying and coloring product, and finally plunging into bath containing formaldehyde, alcohol, dicarboxylic acid, tannin and glycerol.

British, 186,352, Sept. 25, 1922.

Casein plastic is rolled into sheets and pressed into block form in mold having polished lining. Marbled effects are produced by mixing in differently colored particles.

If a glossy effect is desired casein and varnish may be added to the phenol plastic and if a mat surface is wanted, natural resins, linseed oil or wood oil or paraffinic hydrocarbons may be added.

British 228,565, Feb. 1, 1924.

Transparent articles made of celluloid, artificial resins, copal, casein, gelatin, etc. have incorporated therein natural or artificial objects such as silk, lace, embroidery, paper, fabrics, flowers, leaves, suds, feathers, insect's wings, etc. by means of heat and pressure. The article may be in variously colored layers and may include pearl essence. A marbled or mottled effect may be produced by varying the pressure of molding over the surface.

British 237,327, April 12, 1924.

This patent describes a screen for illuminated imitation fires made of Bakelite.

British 246,886, Sept. 9, 1924.

Paper is decorated and impregnated with a urea- or thio-urea-formaldehyde resinoid.

British 247,282.

A fabric is provided with a printed pattern made of fluid or heat hardenable resinoid; bronze or glass powder is then dusted thereon so as to adhere thereto after which the fabric is heated to harden the coating.

British 259,252.

A material resembling the knurled effect of wood is obtained by mixing molding materials of different colors and pressing the same in such a manner that the colors run together without, however, completely blending.

See U. S. 1,593,525.

British 261,029, Nov. 7, 1925.

A vitreous textured product is made from a composition produced by mixing resins, fillers and plasticizers with a resinoid produced in the following manner:—

Dimethylol urea or its derivatives of higher molecular weight resulting from the splitting off of water or analagous compounds obtained from other aldehydes and urea is condensed with formaldehyde while dissolved or suspended in a solvent as ethylene, chlorohydrin, ethylene glycol monoalkyl ethers, ethylene glycol monoacetate or their mixtures with or without heat and a catalyst.

British 265,334, Dec. 7, 1925.

Pliable cardboard or paper is coated with a colored synthetic resin of the amino or phenol-plastic type and subjected to heat and pressure to produce a decorated glazed surface resistant to heat, water and chemicals.

British 277,091, June 8, 1926.

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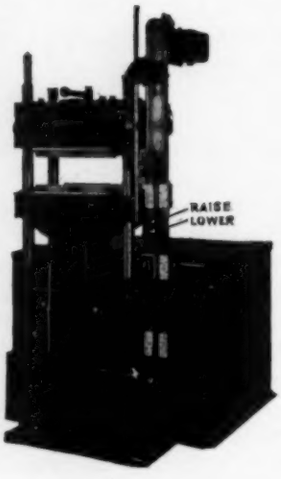

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a urea-formaldehyde resinoid are applied to fabrics to produce a polka dot effect. Pulverized glass, bronze powder or other suitable material may be added to enhance the effect.

British 280,017, Oct. 14, 1926.

Dishes such as cups, saucers and plates are formed from synthetic resin powder. To produce a design, a lace or other open work pattern may be pressed into the material during the molding step.

British 286,012, Nov. 29, 1928.

To produce frosted or stained glass effects, wire gauze is impregnated with an aminoplastic and then coated with granulated glass. Patterned effects may be produced if desired.

British 301,432, Nov. 29, 1927.

In order to produce a design or ornamentation upon a molded article such as a switch plate, the resinoid which may be either of the glyptal or phenolplastic type is hot pressed in a mold which has previously been sprinkled with a finely divided material such as bronze, copper or aluminum powder.

British 307,746, Mar. 12, 1928.

A mass of casein plastic is given an irridescent sheen by subjecting it to stress under heat and pressure and maintaining the stress while setting.

British 308,739, Mar. 27, 1928.

Colored or pattern effects such as representations of marble or special varieties of wood are produced upon plywood by means of paper impregnated with a synthetic resin.

British 318,567, June 5, 1928.

Non-resilient bases such as metal, wood, artificial resins, vulcanized fiber or stone are printed with colored or colorless coatings or designs by use of practically anhydrous lacquers containing cellulose esters or ethers by an intaglio, offset, lithographic or other suitable printing process.

British 322,279, Oct. 8, 1928.

A representation of the grain of an expensive wood is printed on a cheaper wood or other ma-

terial as asbestos by applying to the surface to be printed a foundation coating containing gelatin, albumen or other suitable colloidal substance together with a hardening agent such as chrome alum, formaldehyde or potassium dichromate and printing with a half tone block prepared from a photograph of the expensive wood.

Canada 274,589, Oct. 11, 1927.

See U. S. 1,593,525.

Canada 276,335, Dec. 20, 1927.

Fabrics, paper, leather, fur or feathers are ornamented by means of decorative material secured by drops of hardened urea condensation product.

French 465,047, Nov. 18, 1913.

A horn or ivory substitute is prepared by treating animal or vegetable colloids or albuminoids with ethers of higher alcohols, camphor, naphthalene, sulphur or the resin oil distillation products, dissolving and hardening with formaldehyde.

French 478,884, Jan. 14, 1916.

An ivory or shell substitute is made by fusing phenols such as cresol, guaiacol, etc., directly with a solid liberating formaldehyde such as trioxymethylene. Formaldehyde is then added to avoid prolonged boiling. Before or after fusion, a base such as soda may be added.

French 593,442, Feb. 16, 1925.

Fabrics such as leather are ornamented with fluid or semi-solid primary condensation products of urea and formaldehyde by printing or transfer and hardened by heating.

French 678,510, July 17, 1929.

Decorative effects are obtained by impregnation of textiles with methylol derivatives of urea or thiourea or mixtures thereof with formaldehyde.

German 228,639.

A material suitable for buttons and decorative purposes is made by treating phenol with more formaldehyde or more condensing agent or with more formaldehyde and condensing

(*Continued on page 348*)

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* Installation view of STOKES Single-punch and Rotary Preforming Presses in Bryant Electric Company's plant, Bridgeport, Conn. Other installation views have appeared and will follow in other advertisements.

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Six Hundred Attend First Plastics Symposium

(*Continued from page 326*)

of the Celluloid Corporation and Mr. John E. Walker, Pyroxylin Plastics Manufacturers' Association. In discussing the recent development of cellulose acetate plastics, Mr. Simmonds pointed out how the sales volume of many products had gained a new impetus by the use of this molding material with an unlimited color range, stability of color, strength and resiliency. Pyroxylin plastics were said to be adaptable to all sorts of mechanical processes and economical to fabricate. The list of uses for pyroxylin plastics is a very lengthy one, ranging from safety glass to unbreakable watch crystals.

Rahm on Machinery

Mr. Louis F. Rahm, Associate Professor of Mechanical Engineering at Princeton University and research engineer for the Burroughs Engineering Company, described the mechanical equipment required in the production of plastic materials and also the machinery used in fabricating finished articles out of the various materials. He pointed out the course of development of the hydraulic press up to the present day, showing a slide of a press capable of molding so large an object as the side of an automobile body. Mr. Rahm described in detail the various types of molds used in molding resinoids and pyroxylin.

Speaking of laminated phenolic materials, Mr. A. J. Briggs of the General Electric Company explained how this type of plastic has become indispensable in steel mills, railroad construction, automobile, airplane and refrigerator manufacture and many other industrial applications. Mr. A. J. Norton of General Plastics, Inc., discussed the place of synthetic resin finishes in the industrial firmament. He said that synthetic resins have contributed to the appearance and finish of products in two ways. First, in the contribution of the thermosetting molding compound and more recently, in the contribution of a resin of superior qualities as a base for modern paints, varnishes and lacquers.

Markets for Moldings

Methods of marketing molded products was the subject of Mr. Benn C. Budd of the American Insulator Corporation. He described the potential market for molded products to be of such proportions that if one-tenth of all the manufacturers who could advantageously utilize molded products were to place orders for their requirements for the next three months, it would take all the molding equipment in the country two years to fill these orders.

The manufacture of casein plastics was mentioned by Mr. Charles S. Lawrence, Jr., American Plastics Corporation, who also described the adaptability of these materials in the manufacture of novelties and costume jewelry. New processes for the cheap production of urea recently developed abroad promise to bring urea plastics on a plane more directly competitive with other plastics, according to Mr. Charles E. Slaughter of the Unyte Corporation. He said that the present production of light colored clock cases and tumblers was only a beginning and that the manufacture of panelling for architectural uses was in the offing.

In speaking of the historical aspects of the industry, Mr. Carl Marx, editor of Plastics & Molded Products, described the personalities of some of the inventors of the modern synethetic plastic materials. He sounded a prophetic note by stating that the time would soon come when tons of plastics will be used where now only pounds are consumed; automobile bodies and airplane fuselages will be molded and airplane wings will be made of synthetic materials.

Plastics Exhibitors Attract Crowds At Chemical Industries Exposition

(*Continued from page 326*)

material made by Eastman Kodak Company. Cake, sliced pumpernickel, and cookies were wrapped in a thin foil decorated with the Aquatone color process developed by the Newark Parchment Paper Co. Figs, walnuts, marshmallows and sardines were shown in vacuum-packed cans, the sides of which were made of transparent cellulose acetate. Several of these containers bore trade marks printed on the acetate sheet, yet the contents remained fully visible. The containers are made by the Macolite Corporation, Eastman Kodak supplying the transparent material.

Dow Chemical Company, Midland, Mich., manufacturers of organic chemicals, exhibited at the Chemical Exposition. Their synthetic phenol is a fundamental raw material for the resinoid plastics industry. In the display of the Moto Meter Gauge and Equipment Corp., Toledo, Ohio, one panel was devoted to the products of their plastic molding department. Included were several items which enter into their own finished products as well as a number of custom molding jobs.

Plastics & Molded Products, the only journal specifically de-

voted to the industry, again appeared at the Chemical Industries Exposition at Booth 436. Its exhibit included, in addition to the monthly publication, representative examples of many plastic materials in finished form, large-sized reproductions of pages from national publications which contained articles on various phases of the industry were posted to tell the visitor what other people have said. As a further instance of the educational effort of the publication, 3000 copies of the Plastics Primer, containing original articles and reprints from the press on the fundamental facts concerning materials and processes, were taken during the week of the Exposition. And finally, with the cooperation of eleven executives from the various branches of the industry, *Plastics and Molded Products* presented the first Plastics Symposium on two afternoons in the Exposition Conference Room.

Ornamental Effects

(*Continued from page 345*)

agent than is necessary to produce the soluble product. Among the possible condensing agents are neutral or alkaline salts, as potassium chromate, sodium sulphite, ammonium sulphite, sodium thiosulphite, sodium phosphate and sodium acetate. German 264,567.

Differently colored alkali caseinate solutions are conducted into precipitating bath of formaldehyde and alkaline earth salt or are powdered on backing which is placed into the bath. German 293,510, Aug. 21, 1915.

Pulverulent casein is interposed between unhardened and undried plates of a casein plastic and subjected to high pressure. Plates of variegated color may be made and used as dominoes, also imitation ivory by use of very thin plates of different shades and colors.

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A Really Cheap and Effective Plastic

The natural binders in sawdust or bagasse are employed in conjunction with lime to produce strong molded products

Frederick H. Smyser uses caustic soda to liberate the binder. The process is covered by U. S. P. 1,792,254; Feb. 10, 1931, assigned to General Electric Company.

ONE of the simplest methods of making a molded product has recently been patented. It makes use of cheap raw materials such as sawdust or bagasse, which is treated so as to liberate the binder therein, which latter is then precipitated onto the separated fibers, forming, after drying, a moldable composition.

According to U. S. P. 1,792,254; Feb. 10, 1931, of Frederick H. Smyser, of Marblehead, Mass, assigned to the General Electric Co., the invention relates to a new process for treating comminuted cellulosic material to produce a molded product and to the new product produced thereby which possesses characteristics of quality which render it peculiarly suitable for electrical insulating material or for other purposes for which a hard, infusible compound may be employed.

Waste Materials Used

Waste cellulosic products such as bagasse, sawdust, cornstalks, and the like, may be converted into useful molded compositions by a simple, inexpensive process.

Sawdust (or bagasse)	6 lbs.
Sodium hydroxide	2 lbs.
Water	1 gallon

are placed in a steel digester or autoclave and treated with steam at about 160 lbs. pressure for 3 to 4 hours and then removed. About 3½ lbs. of concentrated sulfuric acid in 3 to 4 gallons of water are now added. The acid precipitates resinous products presumably by decomposition of resinates of alkali metal formed during the digesting process. The mass is filtered and washed, the washing being continued until the filtrate is neutral and free from sulfate.

After drying in the air at about 80° C., an alkaline substance is added and the product thoroughly mixed in a ball mill or tumbling barrel, or otherwise to form a powdered compound ready for molding. In the case of sawdust about 3% of hydrated lime by weight may be added. In the case of bagasse a lesser amount, say 10% of hydrated lime is added. Hydrated barium or strontium oxide may be used. This compound is placed in molds and subjected to heat and pressure. A pressure of about 3000 pounds per square inch and a temperature of 150° C. to 160° C. are usually employed. Under these conditions certain constituents of the mixture become plastic and the material flows taking the exact shape of the mold. At the same time, chemical changes take place so that in a short time, usually in a few minutes, the mass becomes hard and infusible. The molded article may be removed from the mold while hot without distortion.

Such molded articles are hard and strong, possess a high dielectric strength and smooth finish, and are little or not at all affected by atmospheric moisture. Resistance to moisture may be improved by heating the molded articles to about 150° C. for several hours after removal from the molds, by finer grinding preliminary to molding, or by adding small quantities of resins. If it is desirable to reduce the bulk of the powder to facilitate filling certain types of molds, it may be mixed on hot differential rolls or preformed into pills in the usual manner.

By digesting or heating in the presence of steam with an alkali, such as caustic soda, the resinous binding substances are dissolved and the cellulose fibres separated in much the same manner as in the preparation of paper pulp, with the difference that whereas in the preparation of paper pulp the object is to obtain the greatest possible yield of fibre, in this process the products desired are substances capable of reacting to form moldable compounds.

Precipitating the Binder

Upon acidification the resinous and other substances which are to form the binding constituent of the molding compound are precipitated on and around and intimately mixed with the fibres. The alkali salt formed, together with certain other soluble constituents, are removed by washing. The material is air-dried at a moderate temperature to avoid premature setting. This material now contains in addition to the fibre a number of highly complex organic compounds which are believed to be largely acid in nature. If the material in this condition is subjected to heat and pressure it partially decomposes with the evolution of large quantities of gas and does not set or become rigid in any reasonable time, at least up to one hour. However by the addition of an alkaline substance, such as hydrated lime, before molding, a compound is secured which when pressed at a temperature of 150° C. to 175° C. does not evolve gas and becomes sufficiently rigid to be removed from the mold while hot without distortion in 5 to 10 minutes. The amount of alkali to be used for best results varies with the raw material used, whether sawdust, bagasse or

(*Continued on page 362*)

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TECHNICAL ABSTRACT SECTION

A Review of Literature and Patents

The Use of Albertol Copals in Nitrocellulose Lacquers. Alfred Kraus, Farbe & Lack 575, 586-7 (1930).

Because of their uniformity, purity, transparency and neutrality synthetic resins are preferred to natural resins in cellulose ester lacquers. Albertols 111L, 112M and especially 82 G (Aberol H-9) are suitable for use in such lacquers. 82G is sol. in acetone, methyl ethyl ether, ethyl acetate, and amy acetate, butyl acetate, ethyl and butyl lactate, Cellosolve, Cellosolve acetate, diacetone alcohol benzene, toluene, xylene, benzene, solvent naphtha, mineral spirits, chlorinated hydrocarbons, tetralin, turpentine, fatty oils, tricresylphosphate, diamylphthalate, dibutylphthalate, castor oil, etc. but is insoluble in alcohol, methyl-cellosolve, diethylene glycol and carbitol. The presence of the non-solvents do not affect the soly. of 82 G in the above solvents, however. There are 2 types of 82 G, one having acid no. 5-10 and the other 15-20. Each is furnished in extra light, light and dark grades. This resin is not entirely stabile to light, but yellows to about the same degree as ester gum, elemi sandarac and kauri copal. The presence of zinc oxide, light-resistant placticizer or dammar decreases the tendency for 82 G to yellow. Nitrocellulose lacquers containing 82 G are unusually resistant to alkali and alcohol. 10% sodium hydroxide had no action in 24 hours and 50% alcohol had no effect in 6 hours. Albertol 112M is more soluble in alcohol than 82 G, and has a higher acid number. Albertols 111L and 209L are suitable for use in combination (oil +nitrocellulose) lacquers. Albertols are hard resins and lacquers containing them should be well plasticized. Some formulas for metal, wood, and combination lacquers containing albertols are given.

Molded Magnesia Product. Linwood T. Richardson, and Edgar M. Schmiel, assignors to Cutler-Hammer, Inc. U. S. P. 1,793,830; Feb. 24, 1931.

The process which comprises converting a granular fused oxide into a hydroxide while opposing the expansive forces produced therein to provide a coherent mass and then reconverting the product to its original chemical state while maintaining cohesion of its particles.

A molded mass of particles of magnesium oxide cohering as a result of action of pressure chemically generated in the mass.

The process of molding loose noncementitious material comprising granular fused magnesium oxide which consists in placing the same in a mold and hydrating the material to thereby produce within the resulting mass pressures tending to expand such mass beyond the limits defined by the mold, utilizing such pressures in the absence of pressure externally applied to effect rearrangement and cohesion of the particles of the mass, and then dehydrating the mass while maintaining cohesion of its particles.

Stencil Sheet. Shinjiro Horii, of Tokyo, Japan. U. S. P. 1,792,095; Feb. 10, 1931.

	Parts by wt.
Cellulose nitrate	10
Acetone	20
Ethyl alcohol	20
Ethyl acetate	20
Amyl acetate	30
Benzol	30
Naphthenic acid glycerides	15
Paraffine oil at 30° Bé	15

Stencil Sheet. Shinjiro Horii, of Tokyo, Japan. U. S. P. 1,790,987; Feb. 3, 1931.

	Parts by Weight
Cellulose nitrate	10
Amyl acetate	20
Ethyl acetate	30
Ethyl alcohol	20
Benzol	30
Dolphin oil	25
Naphthenic acid glycerides	5

1. A stencil sheet adapted for stencilizing by pressure, consisting of a base of fibrous material having a coating including esters of polysaccharides and dolphin oil.

2. A stencil sheet adapted for stencilizing by pressure, consisting of a base of fibrous material having a coating including esters of polysaccharides, dolphin oil, and tempering agents.

3. A stencil sheet adapted for stencilizing by pressure, consisting of a base of fibrous material having a coating including esters of polysaccharides, dolphin oil, and other oils.

Composition of Matter. Victor Scholz, assignor of one-half to the firm Atlas Ago Chemische Fabrik Aktiengesellschaft, of Molkau, near Leipzig, Germany, U. S. P. 1,796,219; Mar. 10, 1931.

In the process of making a composition of matter consisting of nitrocellulose and linoxyn soluble in a common solvent, the steps of oxidizing and polymerizing the linseed oil in the presence of a lead compound catalyst and by kneading, dissolving the kneaded oil in alcohol with the aid of heat and pressure, then mixing the resulting solution with nitrocellulose.

A new composition of matter which comprises a mixture of nitrocellulose and a product resulting from oxidizing and polymerizing linseed oil in the presence of a lead compound catalyst and by kneading, dissolving the kneaded oil in alcohol with the aid of heat and pressure and evaporating the alcohol.

Floor Covering. Julian T. Baldwin, assignor to Sandura Company, Inc., of Philadelphia, Pa. U. S. P. 1,793,667; Feb. 24, 1931.

Specific examples of binding agents are as follows:

(1)

	Parts by weight
Rosin	100
Dibutyl phthalate	35
Sodium silicate	4
Nitrocellulose	4
Castor oil	2

A dye may be added to the plasticizer which is added to the melted resins.

(2)

	Parts by weight
Ester gum	50
Cumaron resin	50
Dibutyl tartrate	35
Polymerized linseed oil	10

(3)

	Parts by weight
Urea formaldehyde resin	50
Cumaron resin	25
Rosin	25
Tricresyl phosphate	20
Dibutyl phthalate	20

The binding mediums exemplified above are heated, and while in a softened condition are ground with the various body ingredients in proper proportions. Generally about one part of binder is used with one part of body ingredients, but these proportions are subject to variation, depending upon the degree of hardness or resiliency desired. The following is an example:

	Parts
Wood flour, cork dust, etc	10—40
Binding medium	40
Pigment, or filler	40—5

Disc Talking-Machine Record. Honorio Conrado Gonzalez, of Chicago, Ill. U. S. P. 1,792,159; Feb. 10, 1931.

A sound record comprising a disk having a plurality of sound grooves provided thereon, said grooves being in parallel volute spirals, the starting and terminating points of the grooves being in a direct center line of the disk, and the convolutes of one of said grooves arranged in alternate relation with respect to the convolutes of the other of said grooves and each of said grooves being a complete sound selection.

Rubber Conversion Product. Herman A. Bruson, of Akron, O., assignor to the Goodyear Tire & Rubber Co., of Akron , O. U. S. P. 1,797,188; Mar. 17, 1931.

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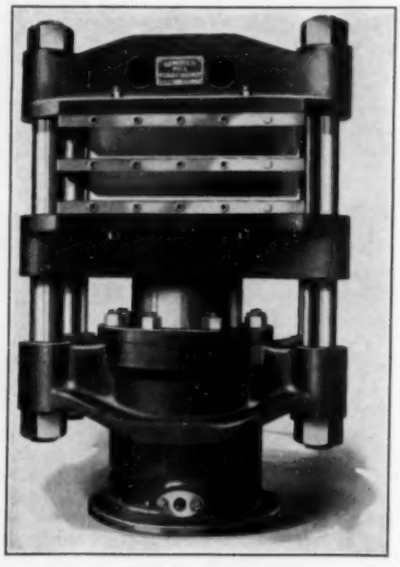

2-Opening Steam Platen Press

In accordance with one form of the invention, ten percent by weight of hydrated chlorostannic acid ($H_2SnCl_6 2H_2O$) is dispersed in solid rubber by milling the two together upon ordinary mill rollers. The product thus obtained is subjected to a temperature of 130° to 150° C. for a period of two to five hours. A reaction product is thus obtained whose characteristics depend upon the length of the period of heating. A relatively short period of heat treatment, or low reaction temperatures results in a tough balata-like product; whereas, a relatively long period of treatment or excessive temperatures results in an exceedingly hard ebonite-like substance. Ebonite-like products may, also, be obtained by increasing the quantity of acid employed.

Either of these materials becomes plastic upon the application of heat and may be sheeted out and mixed with softeners upon a hot mill. The materials thus produced are soluble in benzene and other rubber solvents. Such solutions deposit a tough, flexible, relatively waterproof film when allowed to evaporate upon a surface painted with them and are therefore suitable for uses as lacquers or varnishes in certain cases. The solid products themselves may readily be molded under the influence of heat and pressure to form useful products resembling hard rubber.

Cotton or Wood Cellulose

(*Continued from page 342*)

A test commonly employed is to place 1 gram of the cotton, after lightly compressing the same with the fingers, upon mixed-nitrating acid, into which it should sink of its own accord within two minutes. This test is however not infallible, as some samples from the same lot will pass it, while others will not.

It is better to make a test nitration, during which the cotton must not exhibit any tendency to become soggy, nor to "smoke off" (i.e. to decompose in the acid with evolution of nitrous fumes). The Hercules Powder Co. buys its linters (cotton) on the following specifications:—

Soda-soluble	5%
Ash	0.2%
Fat	0.2%
insoluble in sulfuric acid	0.3%
Iron	0.008%
alpha-cellulose at least	98.5%

For ordinary purposes, with the exception of the very low-

viscosity products, there are employed mainly medium to rather high-viscosity cotton linters. Of course the viscosity of the nitrated cellulose is also affected by the nitration process itself, and can subsequently be further modified by boiling under pressure. It is, however, very desirable to employ types of cellulose that will yield the degree of viscosity in the final product. For regular production of pyroxylin plastics, linters having a medium or high viscosity are to be preferred. For the manufacture of artificial leather, where a strong and highly elastic cellulose nitrate film is required, only high-viscosity cotton is to be used; this being also true in the case of photographic films. For the latter, light color is a further prerequisite.

In a continuation of this article in the next issue of Plastics, the pretreatment and utilization of cellulose from wood, such as sulfite pulp etc. will be discussed. This will be followed by a discussion of the relative advantages and disadvantages of the two types of cellulose; and the factors which are determinative of which is to be used for a given purpose.

Resinoids in Dental Equipment

(*Continued from page 329*)

is used to direct the location of the X-ray tube. For the operator's safety, the time switch which he holds is encased in Bakelite resinoid.

Increasing the dentist's efficiency, minimizing the patient's discomfort, avoiding danger of infection or shock—these are a few roles among the many played by the phenol resinoids. They are now to be found in every major industry, likewise in scores of lesser ones. Look where you will, in airplanes and mines, in boats, trains, and motor cars, kitchen utensils and cosmetic packages, factory machinery and buildings, radios and robots, Bakelite resinoids are always present.

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Some Recent Advances in Aminoplastics

Urea-formaldehyde products are at present the subject of intensive research. The trend of development as evidenced by the most recent patents

By Carl Marx

Editor PLASTICS

INTEREST in the aminoplastics, condensation products of urea and formaldehyde and the like, continues. Quite a number of patents on this subject have recently been received in our Abstracts section. The following are however so detailed and give such a good insight into the trend of development in this field, that we believe a more complete exposition of what they contain will be of value to our readers.

A "technical article" based on a number of issued United States Patents. As supplies of these are limited, we feel sure our readers appreciate somewhat longer excerpts from these than are available in the average "abstract" journals.

A questionaire sent to about 1500 of our readers brought an overwhelming response favorable to the printing of just this kind of information.

We invite the comments of our new friends.

Public Information and Private Monopoly

Incidentally, we have, from a few sources, been taken to task for using patents as a source of information for what "appear" to be "technical articles". The fact is that we know of no more "technical article" in the truest sense of the word than a patent specification as filed for a patent in the United States. In this country the patent specification must be complete, frank, and correct. It must contain sufficiently detailed directions as to how to proceed, so that the public will be fully advised of just what the inventor has discovered, and what it is that he claims. This is not so true of foreign patents, which often contain merely the germ of an idea, or just enough information to "get by" with the patent examiners.

As United States patent specifications, when ordered from the Patent Office, cost ten cents a piece, any one can of course get a copy at a low price. But the Patent Office prints only 50 copies initially, and after these are exhausted it takes four months before another 50 are available. Hence when we reproduce substantially in its entirety, (or in such part as is required for a good understanding of the invention,) any patent, we are in effect furnishing our readers with information to which they are entitled. There are no copyright restrictions on the reproduction of information from patents, as is the case abroad, and hence we are violating nobody's rights nor confidence when so doing.

Oscar A. Cherry Contributes To The Art

The first of these patents is that of Oscar A. Cherry, of Chicago, Ill. U. S. P. 1,790,461; Jan. 27, 1931, assigned to the Economy Fuse and Mfg. Co. of Chicago, on an application filed June 3, 1927.

This invention relates to, the processes of making condensation products from formaldehyde or its polymers and urea, thiourea or its derivatives, and the products made thereby.

It has been found in condensing urea, thiourea or its derivatives with formaldehyde or its polymers, that various products are formed depending upon several sets of conditions to which the reaction is subjected which are: first, the ratio of the amounts of urea and formaldehyde employed, and secondly, upon the condition prevailing as to whether or not the condensation is conducted in the presence of an alkaline, neutral or acid solution.

Condensation Products Formed

It has been determined by past experiments that several different substances are formed as a result of condensing urea with formaldehyde depending upon the prevailing conditions referred to, and that among these products are the following: first, methylene urea $CO(NH)_2CH_2$ and dimethylene urea $CO(NCH_2)_2$; secondly, an intermediate product formed from two molecules of urea and three molecules of formaldehyde with the elimination of two molecules of water, the formula of which is $C_5H_{10}N_4O_3$; and thirdly monomethylol urea which $C_2H_6O_2N_2$ and dimethylol urea $C_3H_8O_3N_2$.

The first of these, that is, the methylene urea and the dimethylene urea are quite insoluble in all ordinary solvents and are found to decompose under the action of high temperature without melting. The second or intermediate compound is thick, white, granular precipitate which is not soluble in any solvent, but will be decomposed

by strong acids and is unaffected by alkalis. The third group of monomethylol urea and dimethylol urea are both easily soluble in cold water and in alcohol but are insoluble in ether.

It is desirable in the formation of condensation products to be utilized commercially, to avoid the formation of a first and second of these products, in that they consist of minute, white granules having an amorphous structure and are infusible and insoluble in ordinary solvents and are of no known commercial value, but on the other hand it is desirable to form the monomethylol urea or the dimethylol urea or a mixture of these in that these substances are soluble and form a solution which is capable of, upon subsequent heat treatment, polymerizing to form a colloid which upon a continuation of the heat treatment becomes viscid, gradually insoluble and finally gelatinized into a hard, insoluble, infusible vitreous mass.

Working Conditions

In view of this, it is desirable to note particularly the conditions which, when prevailing will promote the formation of the monomethylol urea and dimethylol urea to the exclusion of the undesirable condensation products. It has been found in the presence of slightly acid solutions that either methylene urea of dimethylene urea are formed depending upon the amount of formaldehyde employed relative to the amount of urea used, provided however, that the formaldehyde used is less than five parts to one part of urea, but on the contrary, if an excessive amount of formaldehyde, namely, approximately more than five times that of urea is employed, no precipitate is formed, but rather, a solution which is capable of being subsequently gelatinized and hardened, is formed. In addition it has been learned that it is not necessary to use this excessive amount of formaldehyde to form an initial condensation product which is soluble, provided the solution, in the presence of which the condensing reaction takes place, is basic rather than acid.

The initial condensation product is found to be a soluble substance forming a solution which, on standing in the atmosphere or being heat treated is capable of being gradually gelatinized to form a viscid, intermediate product and finally hardened into an insoluble and infusible substance. Although, the formation when relatively small amounts of formaldehyde to that of urea are employed depends upon the addition of a base to the solution to form the initial product, the final hardening is accomplished by rendering a mass slightly acid which may be effected by any one of several well known methods.

Process 1

1200 parts of 40% formaldehyde solution are heated to 90-95° C. under a reflux condenser and 90 parts of urea are added. The solution is then heated to boiling. As soon as ebullition commences the heat is removed, since the reaction that occurs is exothermic, and the solution will continue to boil for some time without the application of external heat. When ebullition ceases, 90 parts more of urea are added. It is unnecessary to apply heat at this stage since the heat of reaction will cause the solution to boil spontaneously upon standing for a few minutes. When ebullition ceases, 90 parts more of urea are added and the process is continued in this manner until 500 parts of urea have been added, the final portion of urea added consisting of 50 parts.

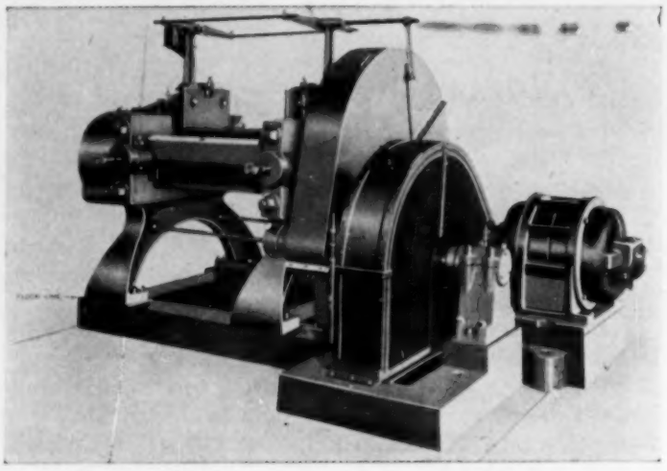
When the final portion of urea has been added and has reacted, a colorless, rather thin liquid is obtained, which is poured into molds. Upon cooling, the product sets to a stiff gel. Upon standing at room temperature, water is eliminated, syneresis occurs, and the product finally becomes very hard, strong and tough. Heating at a slightly elevated temperature, say 50° C. may be resorted to, to hasten the conversion into the final product, but it is unnecessary. This product is unaffected by cold water, but softened by boiling water.

The process differs from that of prior known processes, especially in that the urea is added gradually and in the presence of sufficient acid to produce a hydrogen ion concentration of $1x10^{-3}$. Furthermore, another condensing agent may be substituted for the formic acid present in commercial formaldehyde solution. This step has heretofore been unknown.

For example, to 80 parts of commercial formaldehyde solution is added sufficient alkali or other base to completely neutralize the formic acid. To the neutral solution is added sufficient hydrochloric or other mineral acid to produce a hydrogen ion concentration of $1x10^{-3}$. Thirty (30) parts of urea are then added at 90-95° C. in portions of 6 parts in the manner previously described. Exactly similar results are obtained as when formic acid was used as the condensing agent. The intermediate products made by the above method contain considerable quantities of water. In order to reduce the proportion of water present, paraformaldehyde may be used to replace a portion of the formaldehyde. For example, 20 parts of paraformaldehyde are added to 80 parts of formaldehyde solution, and to the mixture are added 50 parts urea in portions of 10 parts each. The manner of addition is that previously described, except that the solution should be boiled a trifle longer between each addition of urea. Two other examples are given.

Work of the "I. G."

The next three patents form a group, all assigned to the German Dye Trust (Interessengemeinschaft Farbenindustrie A. G., familiarly known as the "I. G.") a combination of all the German dye and organic chemical manufacturing concerns, and undoubtedly the best equipped



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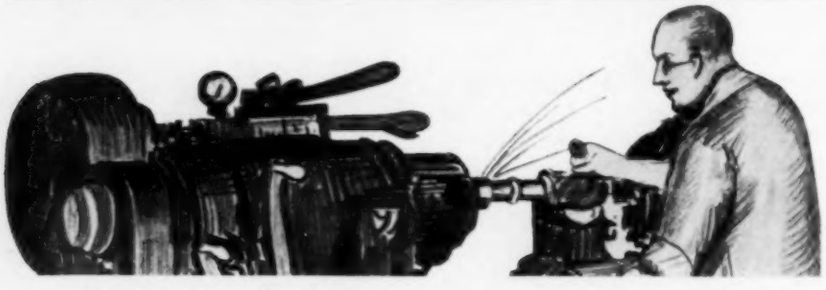

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research organization in the world today). The first of these is that of Martin Luther and Claus Heuck, of Ludwigshafen, Germany; U. S. P. 1,791,062; Feb. 3, 1931, filed Oct. 3, 1927 and in Germany in Oct. 8, 1926. It concerns a condensation product of urea, which is made as follows:

Example 1

240 parts of urea dissolved in 200 parts of water are condensed with 800 parts of 30 per cent formaldehyde in the presence of 1 part of primary sodium phosphate. After the condensation, the hydrogen ion concentration is reduced to pH=6 to 7 by the addition of 4 parts of secondary, and 1 part of tertiary, sodium phosphate, and maintained constant thereat, the solution being concentrated in vacuo at 50° C. After about half the water has distilled over, 2 to 5 parts of formamide are added to the concentrated solution of the condensation product. The concentration of the solution is then continued in vacuo, and the resulting viscous product is poured into a mould. After heating from 60 to 80° C. in a drying cupboard for 24 hours, the product will be completely hardened.

Example 2

A solution of 1200 parts of urea in 800 parts of water is condensed with 4000 parts of 30 per cent formaldehyde, a buffer mixture consisting of 5 parts of 10 per cent acetic acid and 1 part of a 10 per cent sodium acetate solution being employed. After the condensation, 7 parts of dilute sodium acetate solution are added to the solution of the urea formaldehyde condensation product, and the solution is then concentrated in vacuo. Towards the end of this stage a concentrated solution of 10 parts of magnesium chloride is added. The viscous product is completely hardened by keeping it at a temperature of 70° for about 12 hours.

Cyanamide and Formaldehyde

The next two patents of this group may be considered together, both having been filed

on the same day (July 11, 1928) and in Germany on Sept. 10, 1924. Both are the inventions of Hans Schmidt, of Vohwinkel, near Elberfeld, Germany; U. S. P. 1,791,433 and 1,791,434, Feb. 3, 1931.

Schmidt has found that a new condensation product of cyanamide and formaldehyde is obtainable by causing cyanamide to react with formaldehyde in an acid reacting medium. He prefers to carry out the new process in an aqueous solution and use, as starting material an aqueous extract of crude calcium cyanamide.

The following example will illustrate the invention:

Example 1

An extract of crude calcium cyanamide obtained in the customary manner by treatment with water and containing 80 parts by weight of cyanamide, is slightly acidified by the addition of dilute hydrochloric acid. 215 parts by weight of a 40 per cent formaldehyde solution are then added, and the mixture is heated on the water-bath for several hours, until the condensation product separates in an amorphous state. After cooling, filtering and washing the resulting product forms an amorphous powder. On heating it decomposes at 250° C., giving off gas; it is only slightly soluble in cold dilute hydrochloric acid and in dilute caustic alkali.

Patent 1,791,434 cites as an example the following:

Example 1

In an extract of crude calcium cyanamide, obtained in the customary manner by treatment of crude calcium cyanamide with water and containing 150 parts by weight of cyanamide, the lime is nearly neutralized by the addition of hydrochloric acid. 435 parts by weight of a 40 per cent aqueous formaldehyde solution are then added; the reaction begins after a short time and the temperature of the liquid increases somewhat. The condensation product separates as a thick magma, and finally the solution contains no more free cyanamide. After cooling,

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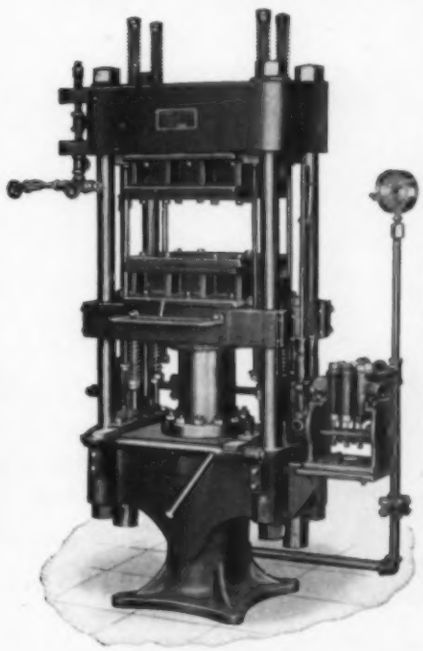

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filtering and washing, the resulting product forms a bulky amorphous powder. On heating it decomposes without melting, giving off a fishy smell; it is only slightly soluble in water and insoluble in most organic solvents. It dissolves, for example, in very dilute hydrochloric acid and dilute formic acid. Under certain conditions such solutions gelatinize. The product also dissolves in caustic soda solution on heating.

The calcium combined with the cyanamide and present in the crude calcium cyanamide extract can also be removed before the reaction, for example, by precipitation with sulfuric acid and filtration. When the calcium has not been thus precipitated or neutralized as above described, by the addition of hydrochloric acid, it is precipitated in the reaction together with the new product.

It has been pointed out above that the reaction is considerably accelerated by the addition of alkali. According to the process of the example, the reaction liquid is kept weakly alkaline by incomplete neutralization of the crude calcium cyanamide solution with hydrochloric acid before formaldehyde is added. The alkaline reaction can also be produced by other alkalies, if desired, also by amines, pyridine and the like. When the solution is neutralized prior to the reaction, a longer time is required for the reaction to begin and for the completion of the reaction. However, it can be accelerated by heat and when heated the solution becomes weakly alkaline.

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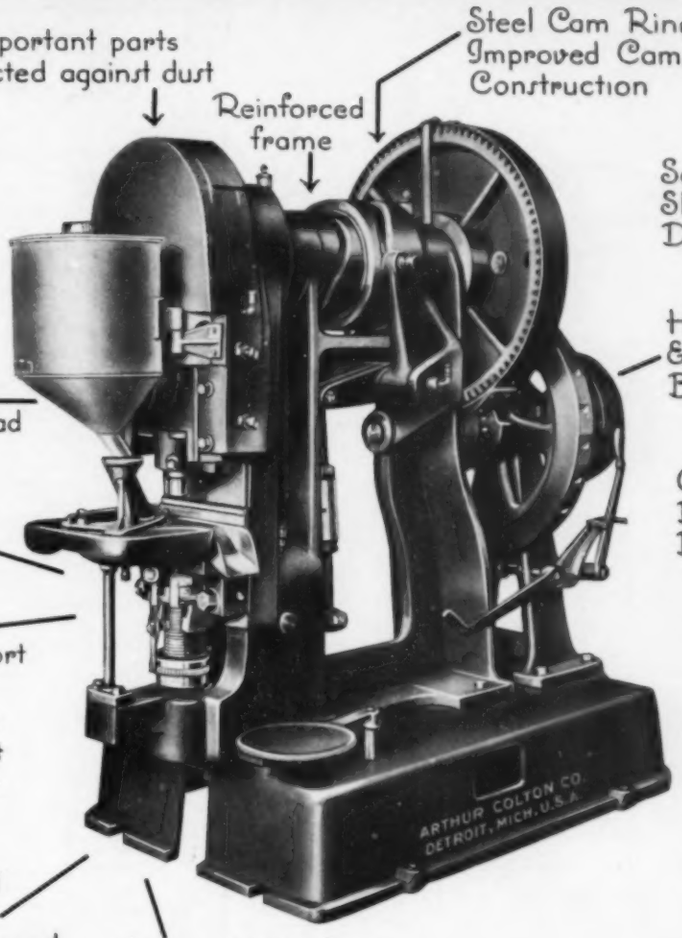
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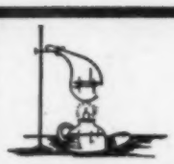

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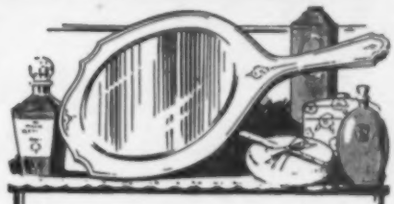

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And Now, In Closing:

THE Lord Mayor of Liverpool, Edwin Thompson, is vice president of the British Society of Chemical Industry . . . for over twenty years he sold equipment for F. J. Stokes! . . . The Isolantite Co. of America, Inc. is now Isolantite, Inc. . . . showing the power of Pepsodent! . . . L. L. Stratton is with Chicago Molded . . . The new applicators that Odo-ro-no and others are using have found high favor . . . Tube-bases are more than dangerous; we feel sorry for the independents . . . Kolster incorporates in Newark . . . Vitalis is now made and sold by Bristol-Myers for Drug, Inc. . . .

WE have found out that, in this industry, at least, legislation is impossible. For several years we have conducted a campaign for educational effort, hoping that some group or association would be big enough to act! You can see the result in the plastics symposium, which we sponsored at the Chemical Exposition. It isn't a question of not being willing and able to do the job for the industry, but one of raising the point of proper balance. It is hard to predict how much longer it will be before some action accompanies all the criticism and objections of those within the industry who are always on the receiving line, never the giving.

How do others view even these necessarily small efforts? As Chem. & Met. says in its May issue: "The large attendance on both days, in spite of the unfavorable lecture facilities, demonstrated an interest in the subject shared by many not directly concerned in the industry . . . Definite plans for future symposia have not been laid, but the obvious interest in this first one should encourage its sponsors to meet the need in the future." Well, it does. But we must remember that the eleven speakers gave their time without thought of any reward and, that if such a program should again be needed, part of this reward must come in some expression from the industry itself.

SOME of our readers have not seen the *Plastics Primer*, from which we quote the following foreword:—

"This Booklet goes from *Plastics*, to spread knowledge of the measure and promise of a Youthful Industry. The Press, both in news and science, is now giving more notice to developments in this Field. Realizing at last the singular values in these materials, the Consuming Public needs to understand them and to test them—to know how to get the most out of them.

Coming demands will awaken this Industry to still greater activity. The present growing interest results from the tremendously accelerated sales of these products, since 1918. Over the latter half of this period, *Plastics* has been the first and only Journal wholly devoted to these subjects. It has always served Research, Production and Technology; but for the future it will pay much closer attention to the factors of Success in Distribution, with the purpose of promoting the rising Sales-Volume that the indispensable plastics deserve.

The contents of this *Plastics Primer* come to you in condensed and partial form. They aim to show the outlines, to some of you who do not know them. All their pages could not carry all of the possibilities ahead, that await workers in Plant and Laboratory, and that will bring new satisfaction to Users and Dealers."

We will be pleased to send a copy of the *Plastics Primer* to any of our readers who request it.

EXCEPT for what is, in some cases, a really shaky financial background, the companies in this industry may be assumed to be in better case than those in many others. Moody's Investor's Service, reporting aggregate earnings for 609 corporations during the first three months of this year, surprises many of us with the "bad news." Compared to the same period of last year, four textile manufacturers in the group showed a drop of 96.8 per cent, copper went down 94.9 per cent., iron and steel declined 91.4 and machinery and toolmaking was off 63.9 per cent. These are all worse, we believe, than plastics, but they are worse than they have any right to be—and so is plastics! Aggressive sales promotion may help, but this industry is still confined by the diaper of manufacturing methods. The talk is always on the subjct of "how did he make it" rather than on "how did he sell it?" The alarm clock of public favor is still ringing—unheeded.

WHILE the air is cluttered up with talk of expositions, it is well to note a word of thanks to the packaging journals who were the sole exhibitors of molded parts pertaining to this field at the recent Packaging Conference and Clinic at the Hotel Pennsylvania, New York City. In a desert of tinware closures, wrapping paper and cardboard containers, the booths of *Modern Packaging* and *Packaging Record* were welcome oases to the plastic-minded visitor.